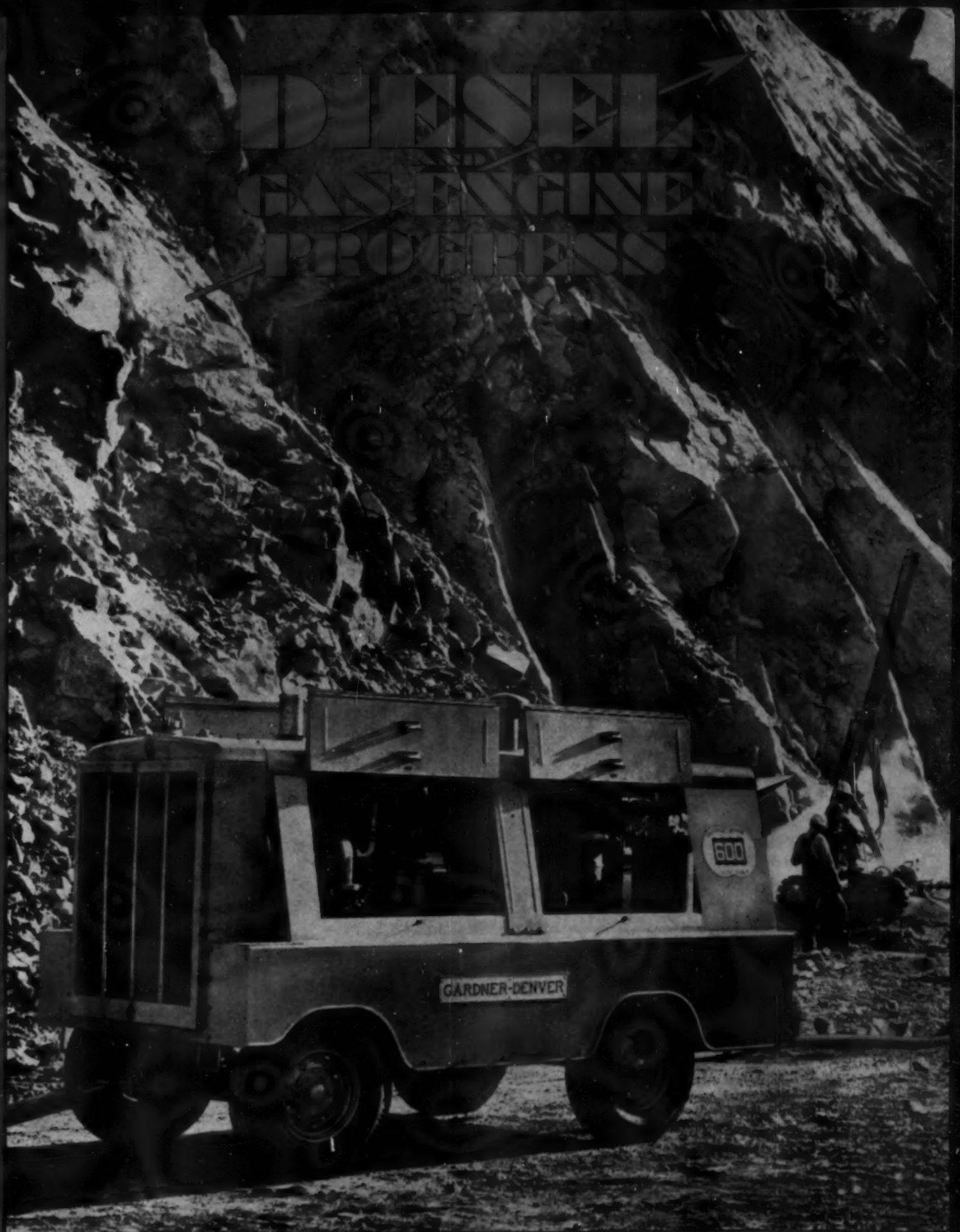
DIESEL GAS ENGINE PROGRESS

DIESEL ENGINES • DUAL FUEL ENGINES • NATURAL GAS ENGINES • GAS TURBINES



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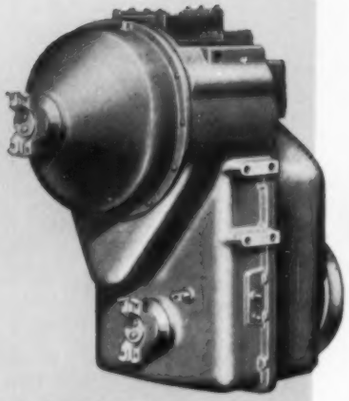

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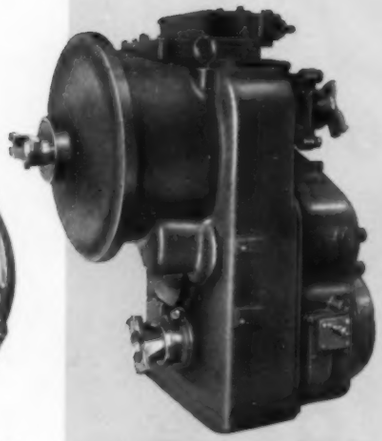
BDB
Transmission

- Four speeds forward and reverse.
- Full power shifting.
- For equipment up to 175 h.p.

HYDRA-DRIVES
Torque Converter

- 3-to-1 torque multiplication.
- Available separately, or with Hydra-Drives Transmission.
- For vehicles up to 500 h.p.



HYDRA-DRIVES
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Transmission

- Four speeds forward and reverse.
- Power shift in each range both forward and reverse.
- For equipment up to 250 h.p.

PEAK POWER OUTPUT FOR HEAVY-DUTY EQUIPMENT...

Hydra-Drives®

Power Shift Transmissions and Torque Converters

Rockwell-Standard's Hydra-Drives units make hard work easy for heavy-duty equipment. The result . . . smooth, efficient, economical operation. A torque converter and 4-speed transmission in one compact package, the Hydra-Drives Power Shift Transmissions have been proved in hundreds of vehicles. They eliminate engine lugging and heavy shock loads. A 3-to-1 torque multiplication makes starting fast and effortless – even with heaviest loads.

Just a flip of the operator's lever accomplishes power shifts without interruption of the power flow. Automatic features of the converter and ease of power shifting simplifies operator training and lengthens vehicle life.

With four speeds forward and reverse, the Hydra-Drives Power Shift Transmissions are ideally suited for vehicles which must travel in both directions during a normal work cycle.

Hydra-Drives Torque Converters are the simplest, most efficient made. They can be matched with any transmission for easier, more efficient operation.

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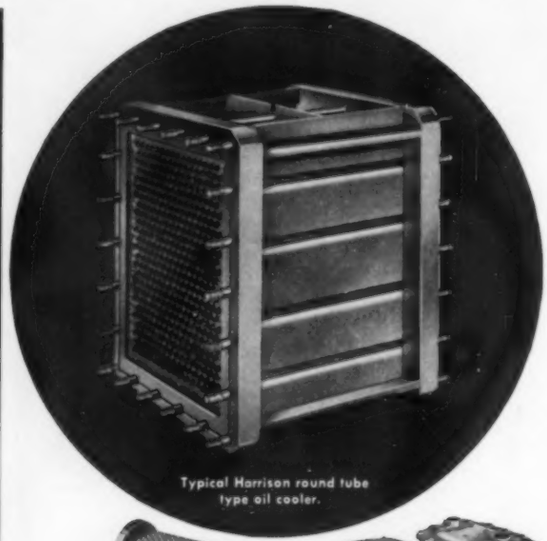
General Motors Reliability in Action...

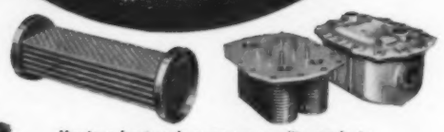
MECHANICAL PAUL BUNYAN STAYS COOL WITH GM HARRISON

HARRISON HEAT EXCHANGERS RELIABLY CONTROL VITAL OIL TEMPERATURE ON DIESEL-POWERED ZEPHYRCRANE

Paul Bunyan would be amazed at the performance of this Link-Belt log loader in the rugged timberland north of Columbia Falls, Montana. It will load an average of 60,000-board feet each 8-hour day in the winter . . . even more in the summer! To keep the oil cool in the crane's powerful GM Diesel engine—that's a job for reliable Harrison oil coolers. Like all Harrison heat exchangers, they're equipped with our own kind of reliability—"measurable excellence"—your assurance that Harrison heat transfer products will perform exactly as planned. You will find this reliability in a wide range of basic types of Harrison heat transfer construction—a complete line of designs from which to select the *right* heat exchanger for your particular application. To save time and money on your temperature control problems, call in a Harrison Sales Engineer at the design stage.



Typical Harrison round tube type oil cooler.



Harrison heat exchangers are quality products of General Motors Research and Engineering.

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HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION, LOCKPORT, NEW YORK

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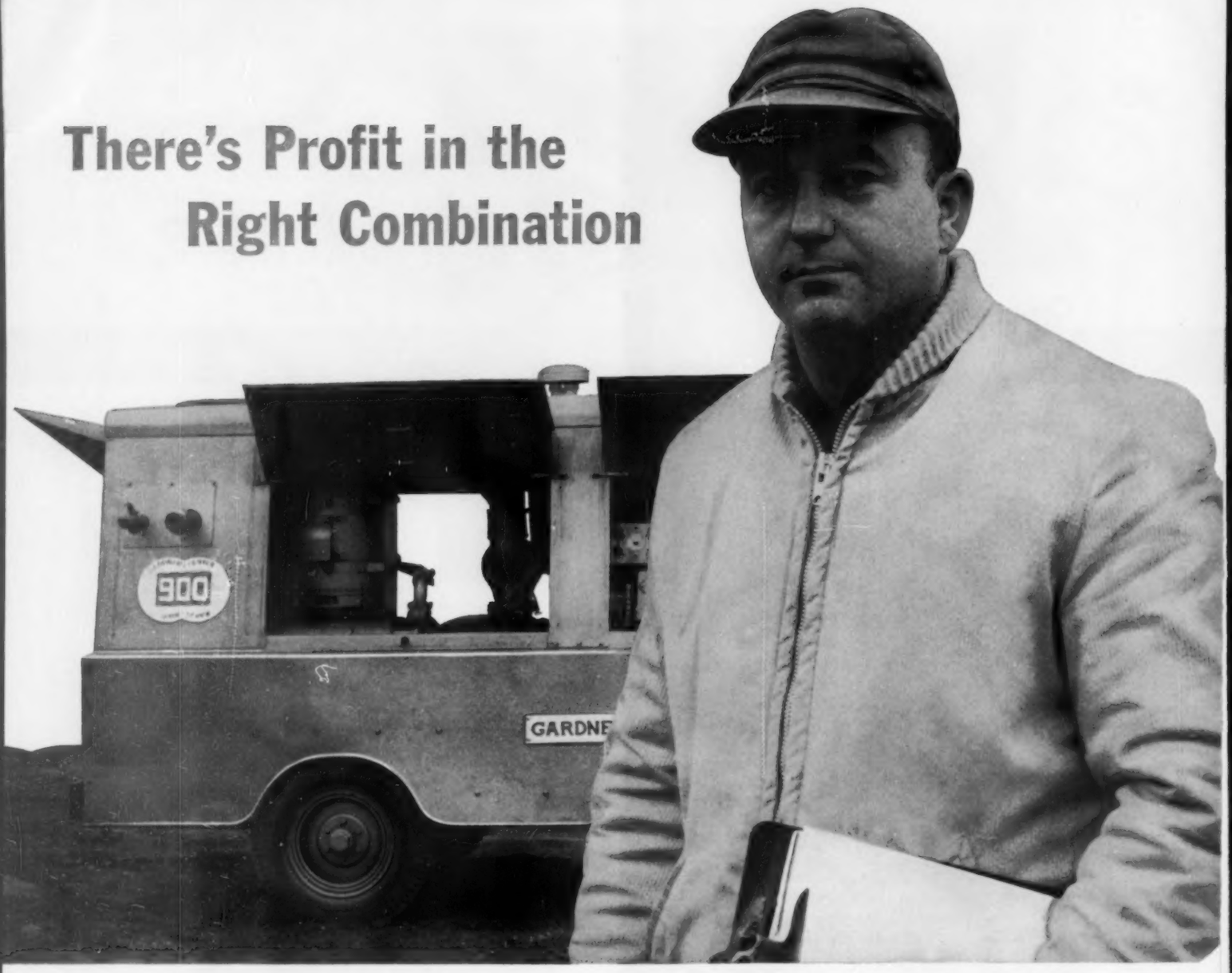
FRONT COVER ILLUSTRATION

Gardner-Denver air compressor, powered with Cat D318 diesel engine, will work for rock drill crew. A story on the units appears on page 44.

There's Profit in the Right Combination



Cat Diesel Power and the New Gardner-Denver "Rota-Screw" Portable Compressor

This major performance breakthrough means new low costs to users of compressed air. Gardner-Denver's helical "Rota-Screw" Portable Compressors eliminate rotor blades, blade chatter, vibration and whine and very nearly make compressor wear a thing of the past. Cat Engines are standard equipment on these diesel compressors with quality in every part—full-length water-cooled liners, steel-backed aluminum bearings, stellite-faced exhaust valves, valve rotators, and low-friction aluminum alloy pistons with cast-iron inserts for the top chrome rings.

Additional efficiency comes from the tinker-free fuel system with its freedom from fouling made possible by single-orifice injectors and precombustion chambers. Now, you can use No. 2 fuel oils as well as premium cost fuels.

Standard in the 600 CFM compressor is a Cat D333; in the 900 CFM model a Cat D343 is used—both have been field proven in many Caterpillar machines.

If you are a manufacturer with a product that can use diesel power, contact Caterpillar Engine Division. Ask for a brochure on the entire engine line. And if you want more information on this new concept in compressors, write to the Gardner-Denver Company, Quincy, Illinois. These new compressors are backed by the nation-wide Gardner-Denver service organization, and the engines by over 800 Caterpillar Dealer service outlets in the free world.

CONSIDER THESE QUESTIONS IF YOU BUILD PRODUCTS REQUIRING ENGINE POWER:

- Are components of your product easy to sell because of customer acceptance?
- Does the entire product (including the engine) receive outstanding parts and service backing?
- Does the product offer a quality label that is so important to user satisfaction and repeat sales?
- Does the entire product have a reputation for high trade-in value?

Facts about Caterpillar. Caterpillar Engines have enjoyed a reputation of high quality for more than 30 years. 5000 Caterpillar Dealer field trucks can provide quick service when needed. Caterpillar Engines have a reputation for high trade-in value and low total cost of owning.

engine power
BY CATERPILLAR

CATERPILLAR

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Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

About 1200 miles from the North Pole, this air defense radar station is operated and maintained by the Federal Electric Corporation, service organization of International Telephone and Telegraph Corporation, who supplied these photographs.

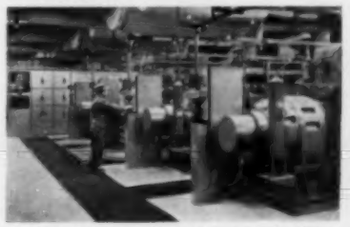
CHICAGO PNEUMATIC, WITH BENDIX® FUEL INJECTION, MEETS CRITICAL POWER NEEDS AT 50° BELOW ZERO

The radar station near Barter Island, Alaska, is a real proving ground for mechanical equipment. As part of the 3000-mile-long DEW (Distant Early Warning) line, the station is subjected to 50°-below-zero temperatures and 100-mph winds.

Under these conditions, five Chicago Pneumatic diesel engines, with General Electric generators, supply the station's prime power. The equipment is establishing an enviable record for reliability, having accumulated more than 87,000 operational hours in the last four years, without trouble. Each of the Chicago Pneumatic engines has been proved capable of operating beyond scheduled overhaul dates by a substantial number of hours.

This kind of dependability is essential at the station because it is located 300 air miles from the nearest re-supply point. In this frozen area there are no roads, and the sea approach is ice-blocked 10 months each year.

Bendix® Fuel Injection equipment provides "lifeblood" to the engines by performing efficiently under the most trying circumstances. The ability to meet all kinds of critical operating needs makes Bendix equipment widely favored in diesel operation. That's why it is being specified more and more as original equipment by diesel engine manufacturers.



Chicago Pneumatic 6-cylinder, 4-cycle diesel engines, with Bendix Fuel Injection equipment, are the "heart" of the arctic power plant.

Scintilla Division
Sidney, New York

THE Bendix CORPORATION

Export Sales & Service: Bendix International Division, 205 E. 42nd St., New York 17, N. Y.

Multiple-turbocharged Richfield compressors prove economy of operation and maintenance

Turbocharging has increased output by 9000 hp on 42 existing compressor installations of the Richfield Oil Corporation, such as this one near Bakersfield, California

Power output of Richfield Oil Corporation's 2 cycle natural gas compressors has been economically increased 30-40 per cent by the AiResearch multiple turbocharger system . . . utilizing existing compressors, personnel and plant size.

At the same time, during the three years in which turbocharged units have been in operation, unscheduled down time and maintenance have been at a minimum.

In addition to long service life, the turbochargers in the AiResearch multiple system are smaller, easier to handle and less expensive to maintain or replace than a large turbocharger of a single unit system.

These rugged turbochargers have also accumulated many years of proven trouble-free operation in a wide variety of the most demanding vehicular applications. Extremely simple in design and requiring no separate cooling system, they are another example of AiResearch leadership in the development and production of air-cooled turbochargers and turbocharger controls for all major engine applications.

Your inquiries are invited.

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

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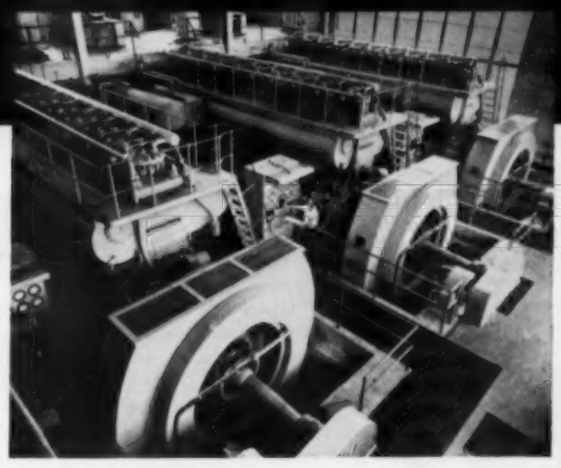
HOUMA LIGHTS ITS WAY with Nordberg engines totaling 25,350 hp



Houma, long known as the shrimp center of Louisiana, has built its municipal power plant around Nordberg engines . . . and has eliminated the necessity for purchased power.

Power demands in Houma have grown steadily since 1949 when the first three 2,000 hp Nordberg natural gas burning engines were added to their 2,900 hp plant. Today, with only two of the original five oil burning engines in use, Houma's 15,800 kw peak load is satisfied by an additional four Nordberg units, the last three being big 10 cylinder, dual fuel engines rated at 5,250 hp each.

When *you* need *long term, dependable* power, consult Nordberg. See why there are so many *repeat orders* like those for the City of Houma for Nordberg Diesel, Duafuel, and Spark-Ignition gas engines, in sizes to over 12,000 hp.

INSTALLATION DATA:

1949—Installed 3 Nordberg 2,000 hp engines.
1954—Installed Nordberg 3,600 hp engine.
1959—Installed 3 Nordberg 5,250 hp Duafuel engines.

NORDBERG MANUFACTURING COMPANY • Milwaukee 1, Wis.

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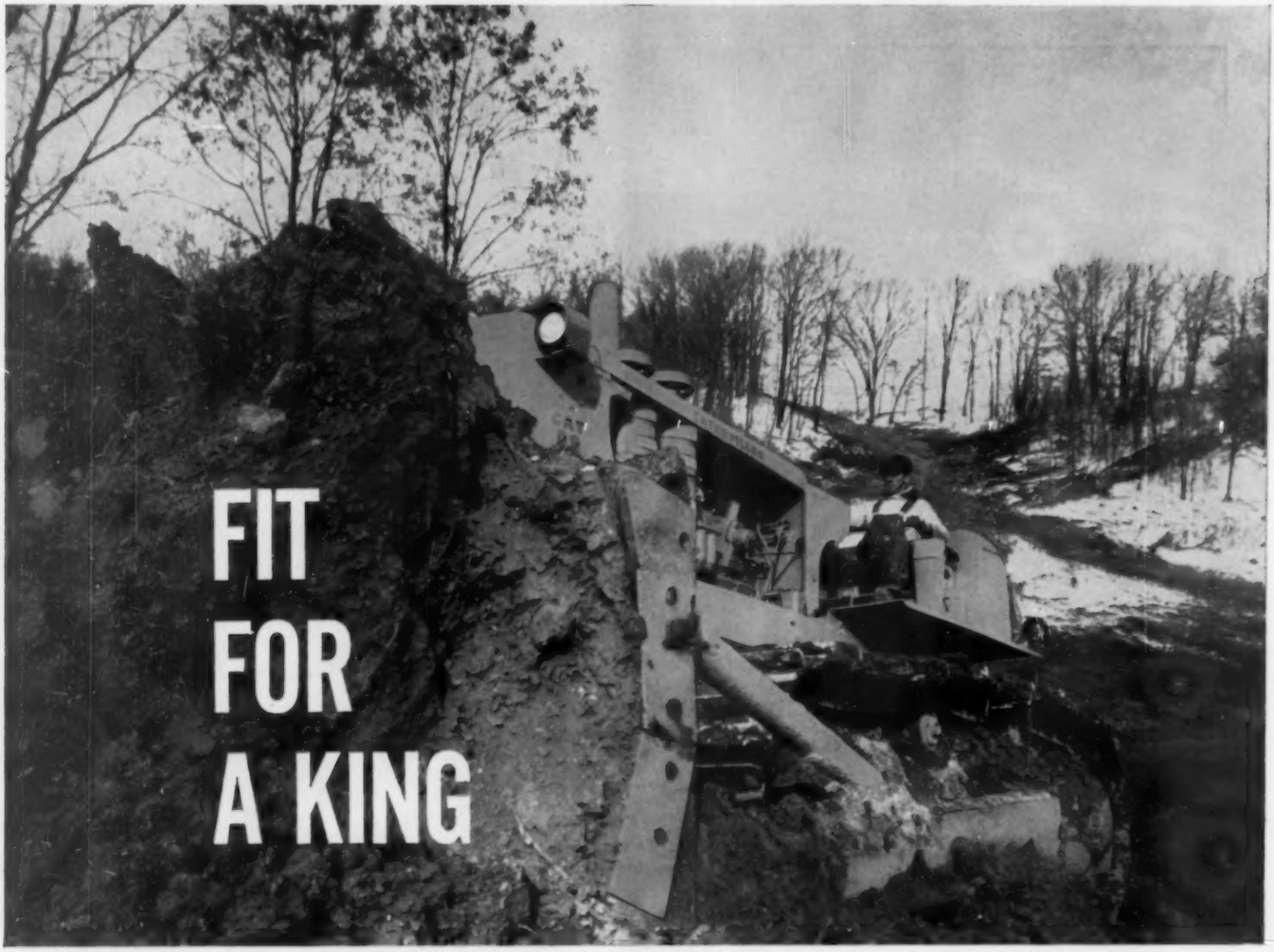
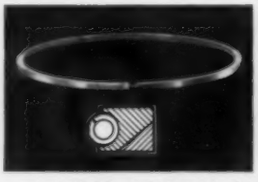


Caterpillar selects Koppers piston and sealing rings for use in the world's largest single engine crawler tractor.

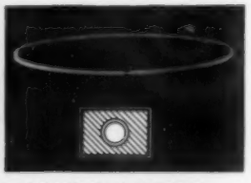
A brute of a tractor for brute force jobs, Caterpillar's D9 Series E Tractor applies a 335 HP engine which combines the versatility and economy of diesel power with the power boosting efficiency of a turbocharger. Traditional Caterpillar durability is built into every part. And in the power shift transmission sealing rings, chrome plated malleable iron compression rings, crankshaft seals, and steering control seals, that durability spells K-O-P-P-E-R-S.

Says Caterpillar: "The D9 Tractor is ruggedly built for long life under the most severe operating conditions. In addition, special attention has been given to insure the production of a power plant that is easy and economical to operate and maintain. On all these counts, the Koppers rings and seals we have selected meet our requirements of quality and dependability."

Write today for 8 page brochure on metallic sealing rings to: KOPPERS COMPANY, INC., Piston and Sealing Ring Department, 6201 Hamburg Street, Baltimore 3, Maryland.



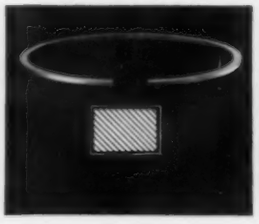
CRANKSHAFT SEALS: Application of a conformable step seal ring (specially designed for Caterpillar) establishes a *permanent* crankshaft seal, reliable for the life of the engine.

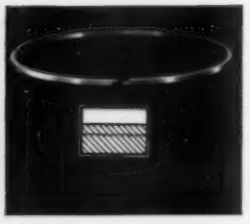


TRANSMISSION SEALING RINGS: Specially designed metallic sealing rings transmit fluid power to the rotor and actuate the clutches of Caterpillar's dramatic new power shift transmission.

COMPRESSION RINGS: Dependable performance at the most critical point in the combustion chamber is assured by chrome plated malleable iron rings.

STEERING CONTROL SEALS: Caterpillar's new design steering control requires a rotating, high pressure seal. Piston ring type seals establish simplicity, reliability.





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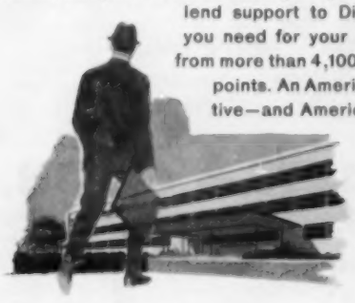

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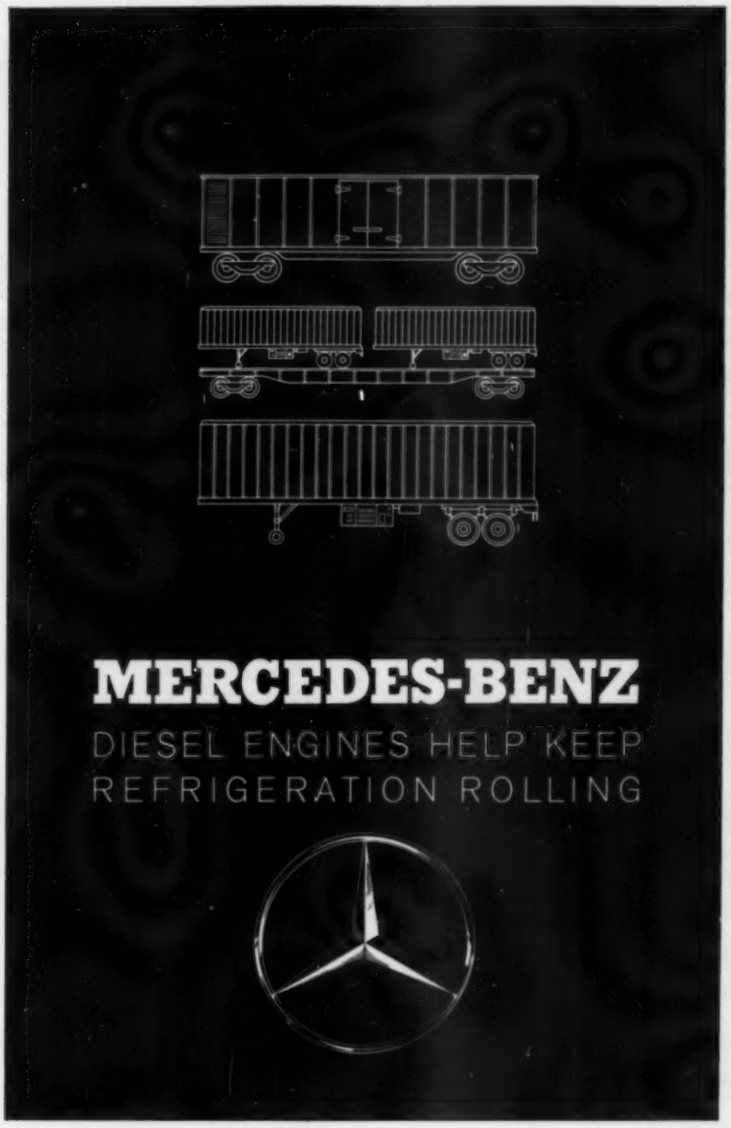

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For HEAVY DUTY, offer the Fuller 92 Series 3-speed Auxiliary

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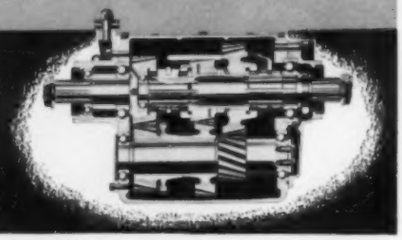

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. . . AND NOW! For MEDIUM-HEAVY DUTY, offer the new weight-saving, cost-cutting FULLER 4-B-73 or 4-B-75 4-speed Auxiliaries.

- Fuller 4-B-73, for use with engines producing approximately 500-600 lb./ft. of torque
- Fuller 4-B-75, for use with engines producing approximately 600-700 lb./ft. of torque

4-SPEED AUXILIARIES

GEAR RATIOS

Models 4-B-73 and 4-B-75

Overdrive	.85
Direct	1.00
Low	1.24
Low-Low	2.22

For full details on the complete line of 3-speed auxiliaries, write Fuller Manufacturing Company; request Form No. 119.

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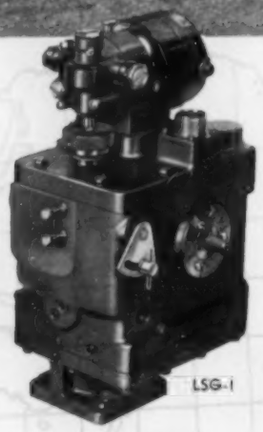

LSG-1

LSG-10

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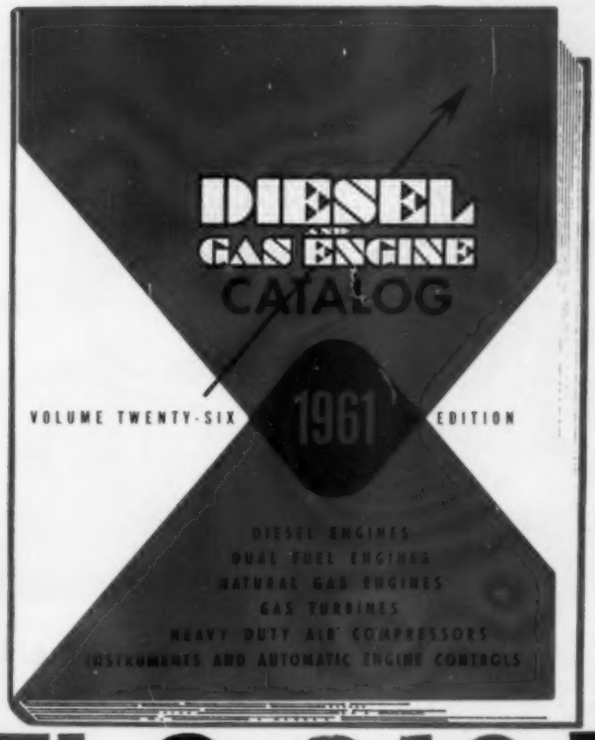

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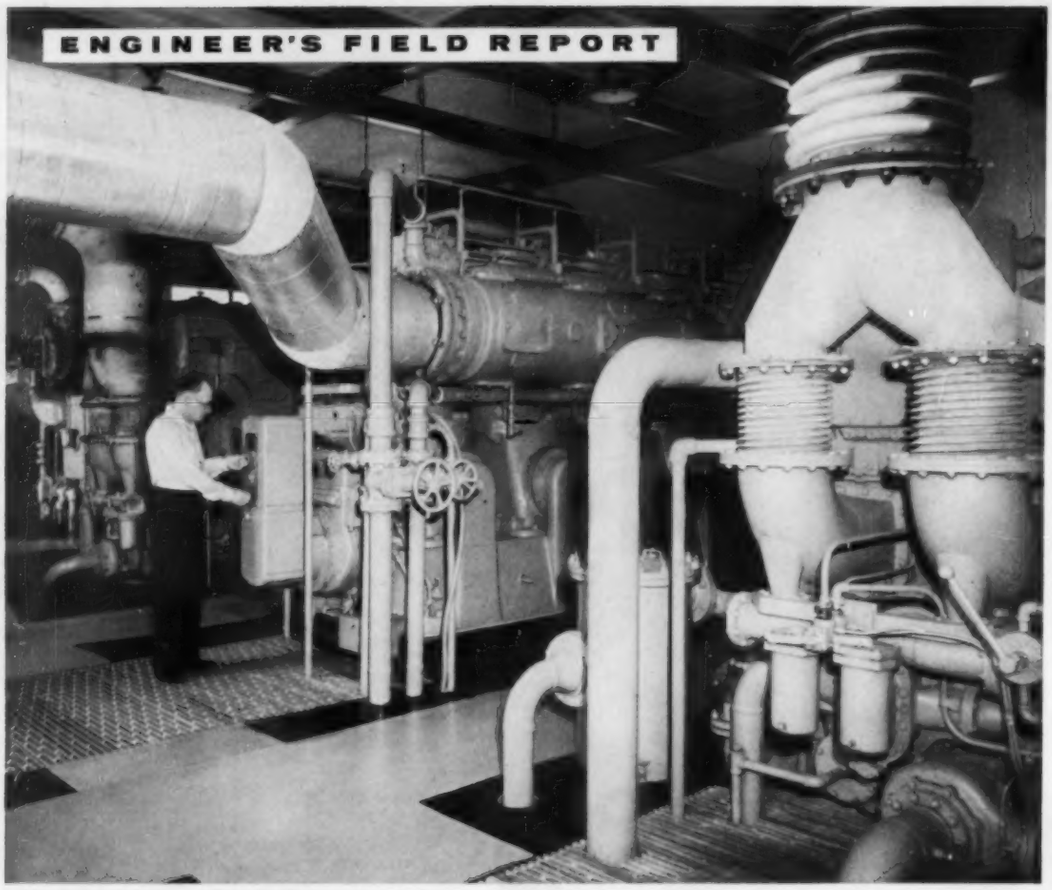

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The Municipal Power Plant, West Bend, Iowa operates four diesel engines generating over 4 million hours of electric power a year. Since 1945, RPM DELO Oils have done an outstanding lubrication job . . . extended overhaul periods, and reduced maintenance costs by 60%.

Plant Superintendent N. P. Cuplin reports: "At the last major overhaul of our 1400 hp. Fairbanks Morse diesel, average wear on ten cylinder liners was only .007 after 4½ years of continuous operation. This is one third of normal wear. Interior parts were clean and unclogged.

"We tried a number of other products before we settled on RPM DELO Lubricating Oil. We've not only cut maintenance expense but have reduced fuel costs too, because RPM DELO's higher cleaning ability has allowed us to use a lower gravity diesel fuel oil."

RPM DELO OIL reduces wear and prolongs engine life because it clings to parts whether engine is running or idle. An anti-oxidant fights gum and lacquer formation, special detergent keeps parts clean. Other additives prevent bearing corrosion, crankcase foaming.

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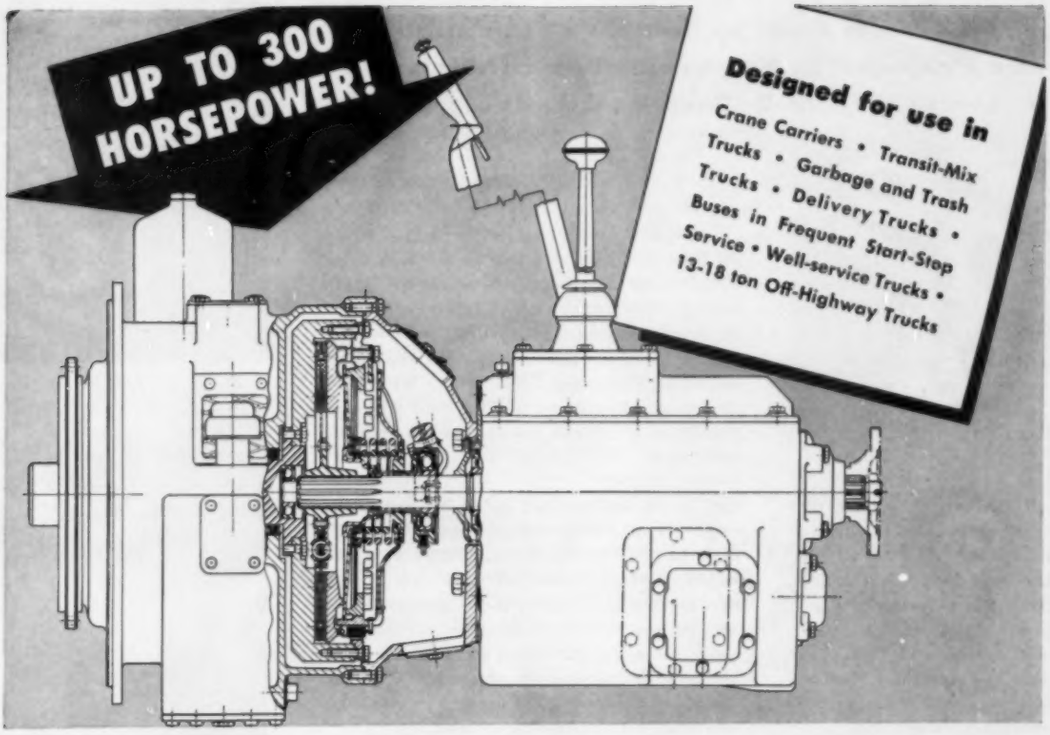
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NEW Torque Converter—Transmission Packages from TWIN DISC

- ***Choice of standard mechanical transmissions—Fuller, Spicer or your own design***
- ***Standard mechanical spring loaded clutches—Lipe or Spicer***

Twin Disc's new torque converter-mechanical transmission units are the result of a design project in which Twin Disc engineers worked in close cooperation with engineers of leading transmission manufacturers. What they perfected is a "package" designed to meet specialized power transmission needs—the needs of vehicles engaged in frequent start-stop service or subject to wide variations in load conditions.

With a Twin Disc converter-transmission package, users of such vehicles can realize these important benefits:

- Automatic torque multiplication in all gear ratios
- Sudden load increases easily handled without shifting gears
- Smooth, effortless starting—engine stalls completely eliminated
- "Fluid cushion" protection throughout the drive train for less downtime, longer life
- Increased driver efficiency because operation is far less fatiguing

The new Twin Disc package offers several advantages over other converter-transmission units. Capacity range is greater—up to 300 hp and 650 lb-ft of torque. Furthermore, Twin Disc permits the user to select the make of transmission he prefers. A third "plus" feature is the fact that Twin Disc uses a standard spring-loaded clutch which provides the familiar "feel" that vehicle operators want.

Twin Disc engineers will be glad to work with you in adapting this converter-transmission package to your vehicle's requirements.

Send for Bulletin 511

TWIN DISC

Torque Converters

TWIN DISC CLUTCH COMPANY
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O-P POWERED YTB TUGS TOP NAVY REQUIREMENTS

New Class 760 Vessels Built by Southern Shipbuilding Corp. and Propelled by Fairbanks-Morse Diesels Perform Well in Bollard Pull Tests

YTB 757, better known as the *Oshkosh*, is one of seven tugboats built or underway at the Slidell, La. yards of Southern Shipbuilding Corporation for the U.S. Navy. The YTBs, all identical in construction represent a new series of Navy tugs—Class 760. And each is powered by a 2000 hp Fairbanks-Morse opposed-piston diesel which drives through a Lufkin reverse-reduction gear equipped with a Wichita clutch to a 12 ft. four-bladed propeller.

A culmination of civilian engineering, the contract for the new tugs was awarded to Southern Shipbuilding in competition with 18 other companies who submitted over 50 different designs. Design and construction was to commercial specifications based upon a brief requirement for harbor duty to assist carriers and other large Navy craft in docking and undocking, fire protection on the water front, and also cruising ranges for possible emergency rescue service.

Thus far Southern Ship has delivered its first contract for four vessels to the Navy and is now building three more on an additional contract. Official tests have been highly satisfactory and have exceeded Navy requirements. As an example, the *Oshkosh* during its bollard pull tests recorded about 69,000 lbs. ahead and 54,000 lbs. astern against 50,000 lbs. and 32,000 lbs. respectively of the original requirements by the Navy. The free running speed was 12.7 knots at rated engine rpm surpassing requirements of 12 knots. With reference to cruising range, the YTBs have a fuel oil capacity of 30,000 gals. sufficient for a round trip to Europe.

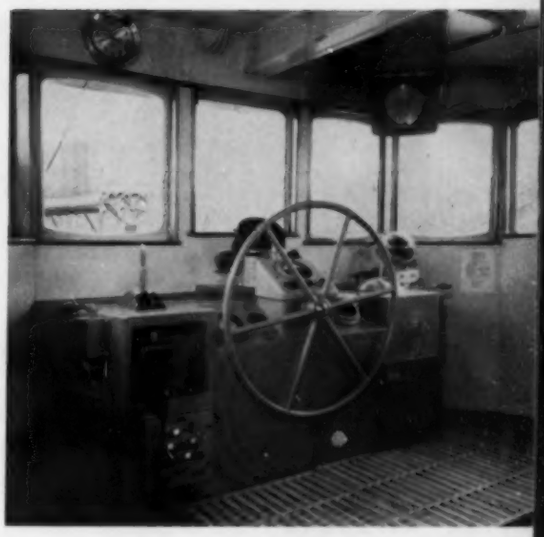
Each of the tugs measure 101 ft. in length, 29 ft. in the beam, with a designed draft above keel of 13 ft. 6 in. Classification is to ABS+A1 towing service, +AMS. Notable on the vessels is their slim hull form, a design which was tested in the Wageningen tank and does provide excellent course keeping characteristics and good maneuverability—a tactical diameter of about 200 ft. Also her ability of drawing the figure 8 in astern maneuvering was noted during the tests.

Rated speed of the Fairbanks-Morse diesels is 850 rpm. These propulsion engines are the Beloit company's model 38D8⅛ O.P.—10 cylinder, naturally aspirated units of 8⅛x10 in. bore and stroke

YTB 757, the new U. S. Navy tugboat *Oshkosh* during official trials. Vessel is 101 ft. in length and is one of seven being built by Southern Shipbuilding Corp. Mast is designed so it can be folded down.

The Class 760 YTBs are designed with a slim hull form for course keeping characteristic and excellent maneuverability. Free running speed was 12.7 knots, bettering contract requirements.

Robt. S. King Slipmatic controls are used in the pilot house and engine room. Pneumatic system links Woodward engine governor and Wichita air-actuated clutch on Lufkin gear.



rated 2000 shp. Precise control of power is provided by the large model 4220 Lufkin reverse-reduction gear with a 5.70:1 ratio. Each of the Lufkin gears is equipped with a Wichita air-actuated, slippable clutch. Control of clutch is remote from the pilot house through a pneumatic system coupled with the engine governor. With this gear-clutch combination, it is possible for the opposed-piston diesel to ease into the full load before the tug puts full strain on the tow lines or into actual physical contact with the vessel being maneuvered. Engine rooms are spacious with ready access to all propulsion components, pumps, filters and other accessory equipment.

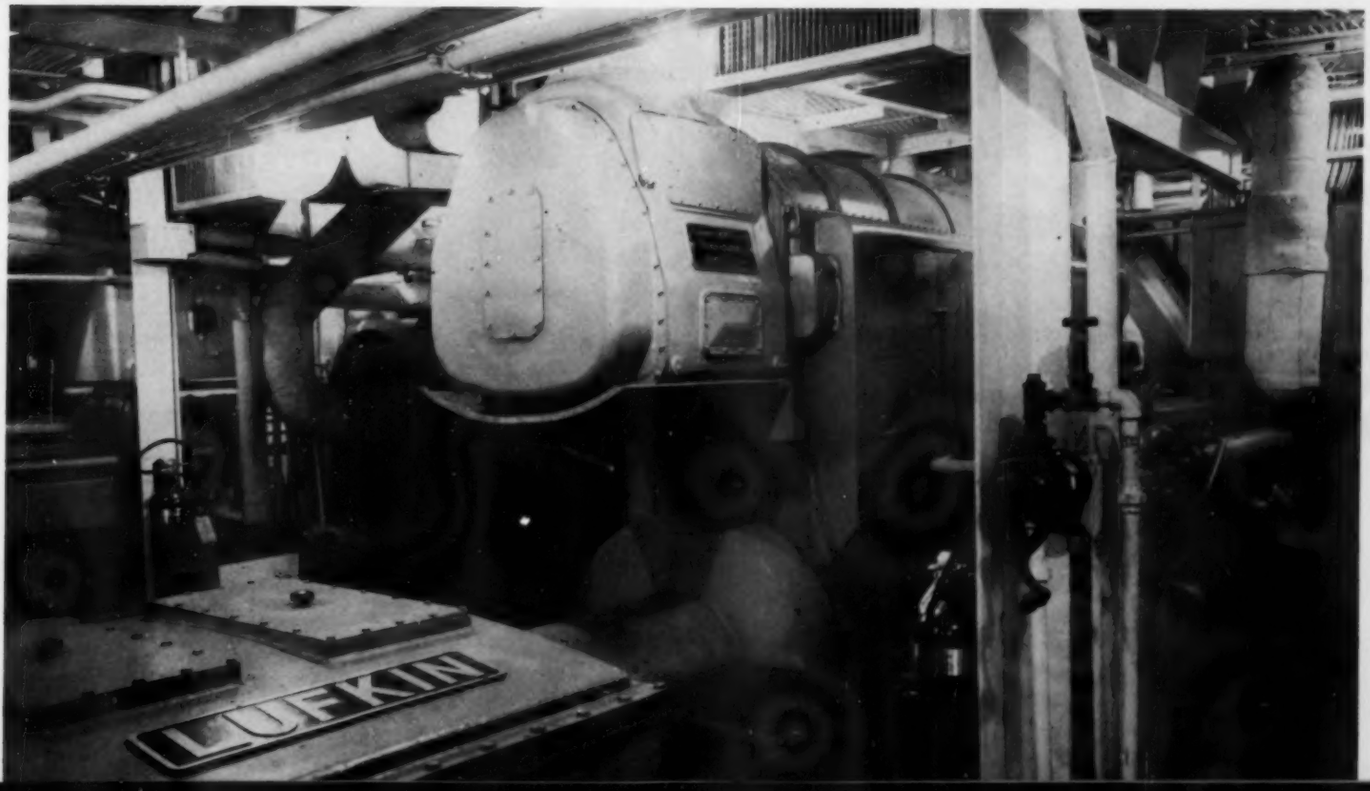
Auxiliary power aboard each vessel is supplied by a pair of GM Detroit Diesel 6-71 diesels driving 60 kw Delco generators. Another GM diesel is installed for powering the 2000 gpm, 125 psi fire pump. There are two fire monitors on the boat deck and eight fire hose connections on the main deck. The YTB 760 Class has accommodations for 12 crew members.

View of the Lufkin reverse-reduction gear with Wichita clutch as it was lowered into the hull of the tug, *Oshkosh*, first of the YTBs to be built.

Fairbanks-Morse O-P propulsion engine drives through a Thomas flexible coupling to the Lufkin gear. Air-Maze air filters are shown as is one of two GM Detroit Diesel electrical sets with 60 kw Delco generators.

Principal Equipment Listing For Class 760 Navy YTBs

Engines	Fairbanks-Morse
Reverse-reduction	Lufkin
Air-actuated clutches	Wichita
Governors	Woodward
Exhaust silencers	AMF Maxim
Intake air filters	Air Maze
Lube oil filters	Hilliard
Lube oil pumps	Roper
Lube oil coolers	Ross
Lube oil strainer	Air Maze
Fuel oil filters	Nugent
Engine-gear coupling	Thomas Flexible
Oil & water thermostatic valves	Amot
Thermocouples & pyrometers	Alnor
Air compressors	Quincy
Auxiliary diesels	GM Detroit Diesel
Auxiliary generators	Delco
Fire pumps	Goulds



GIANT HAULS SPECIALTY OF TUCSON FIRM

TUCSON Warehouse and Transfer Company, which as an authorized moving agency transported its first shipment of goods in Arizona with a freight wagon and horses back in 1892, today is using diesel engines and heavy-duty tractors to carry payloads up to 100 tons.

The firm is not only one of the oldest organizations of its kind in the West, but perhaps the most unique. In addition to its regular household and commercial moving duties as an agent for Aero Mayflower Transit Co., the Tucson Warehouse and Transfer Co. has, in recent months:

- Transported a 100-ton diesel engine to a railhead.
- Hauled and set several 68,000 pound transformers for the Tucson Gas, Electric Light & Power Co.
- Moved $58 million in cash and securities for the Southern Arizona Bank & Trust Co., when that organization changed quarters.
- Delivered 125 tons of bridge I beams to a construction site.

Tucson Warehouse & Transfer Co. is an outgrowth of a company founded in 1892. It was purchased in 1911 by Colin Cameron who was one of the pioneer cattlemen of the state. His daughter, Mrs. M. C. Wakefield, has been president of the company for the last 40 years. H. W. Harpham, vice president-general manager, has been with the company for nearly 45 years. Albert E. Kinder, Jr. is secretary and assistant manager. J. W. Hardie is assistant secretary. The firm is a common carrier, operating throughout the State of Arizona, hauling heavy machinery, steel products and household goods. In Tucson and vicinity the company operates a general trucking business for the hauling of all commodities within 25 miles. The company presently employs 75 persons. They have their own yards for unloading heavy equipment, shops for repairs and general maintenance and conduct quite an extensive operation. Equipment operated runs from one-half to 100 tons and includes motor cranes of 20, 30 and 40 ton capacity.

The Tucson firm bought its first truck, a ¾ ton Little Giant, in 1911. Today it operates 75 pieces of equipment in its truck rental, crane service, fork truck, heavy hauling, house moving, packing, shipping, storage and commercial warehousing operations. Of particular interest to our readers is the heavy duty diesel equipment which TWTC operates to handle massive machines and construction materials. The company has six heavy-duty diesel tractors for these rugged jobs, the newest being an Autocar DC10464-LS ten-wheeler with 250,000 lb. gcw. It was manufactured by the Autocar Division of the White Motor Co., to Tucson Warehouse and Transfer's hauling requirements. It is powered by a 220 hp Cummins NH-220 diesel engine and drives through a Spicer 14 in. clutch and Fuller 10 speed model 10B1120 transmission and Spicer 4-speed auxiliary transmission, model 8341A. "The new Autocar recently moved the 70-foot long bridge I beams as though they were another load of household goods," points out H. W. Harpham.

One of two White 2864DOH models owned by the company recently moved the 100 ton diesel engine to a railhead. These tractors, usually pulling low-boy trailers, have Cummins NH-200 diesels rated 200 hp at 2100 rpm. A smaller White tractor is used for household moving jobs in which cube rather than weight is emphasized. It is a member of White's new 2000 tractor series and has a Cummins JN-6-B diesel which has bore and stroke of

White tractors operated by Tucson Warehouse and Transfer Co., with 68,000 lb. transformers on move for utility company.

UNIT NUMBER TYPE TRUCK OR TRACTOR	ENGINE MAKE OR MODEL & HP	TRANSMISSION	CLUTCH	REAR AXLE	FRONT AXLE	LUBE OIL FILTER
WC 28 WHITE	CUMMINS JBS 150 SUPER CHARGED	SPICER 5CW65 SPICER 8341A	SPICER 15"	DOUBLE REDUCTION TIMKEN 6.33	EE 900 TIMKEN	LUBERFINER 750
WC 28640H WHITE	CUMMINS NH 200	10B1120 FULLER SPICER 8341A	SPICER 14"	DUAL TIMKEN 7.75 SFDD	FE 900 TIMKEN	LUBERFINER 750
4200T WHITE	CUMMINS C160	SPICER 541B SPICER 7231	SPICER 15½"	SINGLE TIMKEN 6.16C124	1150 ELLIOT	LUBERFINER 750
2000T WHITE	CUMMINS JN-130	CLARK 205V	SPICER 14"	SINGLE TIMKEN 6.16-336C	FC90T TIMKEN	NUGENT FULL FLO
10464-LS AUTOCAR	CUMMINS NH 220	10B1120-FULLER SPICER 8341A	SPICER 14"	DUAL TIMKEN 7.75 SFDD	FG 900 TIMKEN	LUBERFINER 750
10264 AUTOCAR	CUMMINS NH 195E	SPICER 8241 SPICER 8341A	SPICER 14"	DUAL TIMKEN 7.75 SQHD	EE 900 TIMKEN	LUBERFINER 750

Equipment chart for TWTC heavy duty tractors.

Autocar model 10464-LS diesel tractor hauls a 30 ton P&H crane through the Arizona hills to a job site. Tractor is equipped with Cummins NH-220 engine, Fuller main and Spicer auxiliary transmission, Timken axles and Luber-finer oil filter.

4⅛ x 5 in. and develops 130 hp. In addition to the special trucks and tractors, Tucson Warehouse and Transfer has 18 trailers, 12 of the utility type ranging from 10 to 100 tons and eight custombuilt models ranging up to 40 tons.

"There's considerable mountainous work in our operations," said Floyd A. Barber, superintendent of maintenance. "Today, for example, we're placing an 803 Lima shovel on the Observatory Site at Kitt Peak (elevation 7450 ft.) 50 mi. southwest of Tucson. The last seven miles to this site has some grades as steep as 26 per cent. The roads of Arizona over which we operate run from a low of 700 ft. to a high of 9500 ft. above sea level and include every type from modern dual highways to "fresh cut" accesses."

Besides building some of its own equipment, such as the eight trailers, Tucson Warehouse and Transfer maintains its own fleet 100 per cent, and operates its own service station, according to Floyd Barber. Standard Chevron fuel oil and RPM Delo lube oil are used in all company diesel units. Tucson Warehouse's maintenance program is set up on a 10,000 mi. or 300 hr. basis for units operating on hour meters. At the proper mileage or hour reading the unit is dispatched to the shop where a work order is written giving a description of the work to be done. The 10,000 mi. preventive maintenance check includes valve and injector adjustment, fan and compressor belt check, and a check of the light, horn, brakes, cooling system (including Perry water filter), and heater hoses and pack front wheel bearings.

The units go over the lube rack each 500 mi. for chassis lube only. Oil is changed at 1500 mi.. oil filters changed at 5000 mi. All gear boxes are changed at 25,000 mi.

The company has not has a major overhaul on any of the Cummins engines now in the fleet. The trucks owned by Tucson Warehouse range from a 1951 model with over 300,000 mi. on the engine to a 1961 model with no significant mileage when this data was gathered. The company operates all their diesel engines about 100 rpm below governed speed, Barber said.

One interesting member of the Tucson fleet now does little more than administer good will. It is a 1913 White acquired about 4 years ago from another Arizona firm and restored in the Tucson shop. "It was restored to as near its original condition as possible in our shop," said Barber, "using the original motor, transmission, rear end, magneto and solid brass radiator as found. The original-type gas headlights and kerosene side and tail lamps were purchased from antique dealers."

Mechanic Roy Brown tests electrical equipment on a White tractor. This model 2000T unit is equipped with Cummins JN-130 engine.

POWER FOR SUBURBIA IS WATERLOO STORY

New Nordberg 2400 HP Diesel Adds Capacity, Aids Efficiency of Electric Plant as Illinois Farm Town Attracts St. Louis Commuters

FARM land around Waterloo, Ill. is rich—as it has been for countless generations. This was farm country 60 years ago when the municipal light plant started up a pair of steam engines to produce electricity for those prosperous residents who could afford electric lights. The village existed to handle produce of the farm and serve the farmer's needs. Modern Waterloo still performs this function—with a feed mill, dairy, and cooperative grain elevator, with a growing number of varied retail stores. Power lines probe out a few miles into the countryside to carry municipal power to the nearby farms. But while Waterloo retains its comfortable small-town flavor, it owes its growth to that phenomenon of metropolitan areas—the flight to the suburbs. Waterloo is just 25 mi. southeast of St. Louis, Missouri, an easy 40-minute drive, and every year 50 to 60 homes are built for new families moving out from the crowded city to enjoy suburban life in the relatively spacious farm community.

To serve this steady, accelerating influx of residents and to meet the growing demand of existing population, the municipal power plant has had to expand. Latest expansion was the installation in June, 1959, of a 2400 hp, 1700 kw Nordberg engine-generator unit. Plant capacity was boosted to 5511 hp, an increase of 83 per cent.

For some years the Waterloo plant relied on six engines that were from 5 to 28 years old, ranging in size from 300 hp to 805 hp. In May, 1959, the month before the new Nordberg went on the line, peak load was 1650 kw and every engine in the plant had to run to meet the demand. That summer, peaks rose to 1750 kw. Under the administration of Mayor Aubrey B. Nance and the city's Consulting Engineer G. Carl Cooper, Jr., Waterloo officials set a number of requirements in seeking a new engine. It had to be big enough for convenient baseload service. It had to be a dependable, heavy-duty prime mover since it had to be efficient, and finally, it had to be adaptable to use of economy fuel. The engine selected is a four-cycle, 12-cylinder, Supairthermal V-type, Nordberg diesel with a 13-in. bore and 16½-in. stroke, rated 2400 hp at 450 rpm.

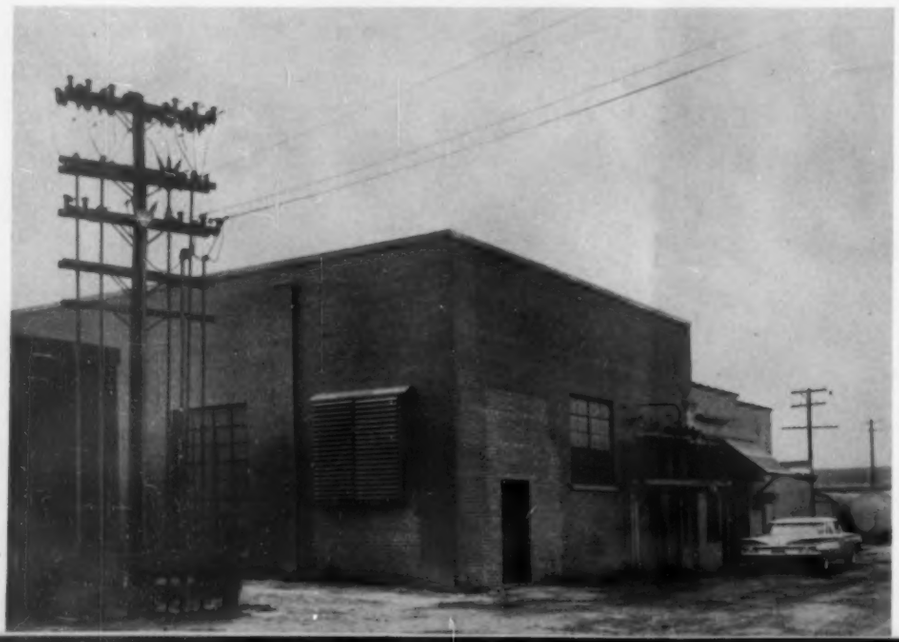
Although Waterloo does not have natural gas, they chose a Duafuel diesel, capable of operating on natural gas fuel with a small quantity of pilot oil. Mayor R. H. Winget is conducting negotiations to obtain a gas supply from the pipeline that serves the St. Louis area. Meanwhile, the big engine is running on fuel oil. Though its full potential for economy will not be realized until gas becomes available, the Nordberg already has effected an appreciable reduction in fuel costs.

Put into service in mid-June of 1959, the new unit took over the bulk of the load. Normally it is put on the line at 7 a.m. and runs until 11 p.m. six days a week, handling the load range between 800 and 1700 kw. The late night load drops down to 800 kw in hot weather and as low as 500 kw in winter. The other diesels are alternated in a supporting role as required.

In something less than seven months of 1959 after installation and start-up the Nordberg pro-

The compact 2400-hp Nordberg and its 1700-kw Elliott generator occupy little more space than some older engines one-third the capacity. Inspecting the Woodward governor is Supt. Ray Hesterberg.

The Waterloo, Illinois, municipal electric plant where a new Nordberg diesel has raised capacity 83 percent.

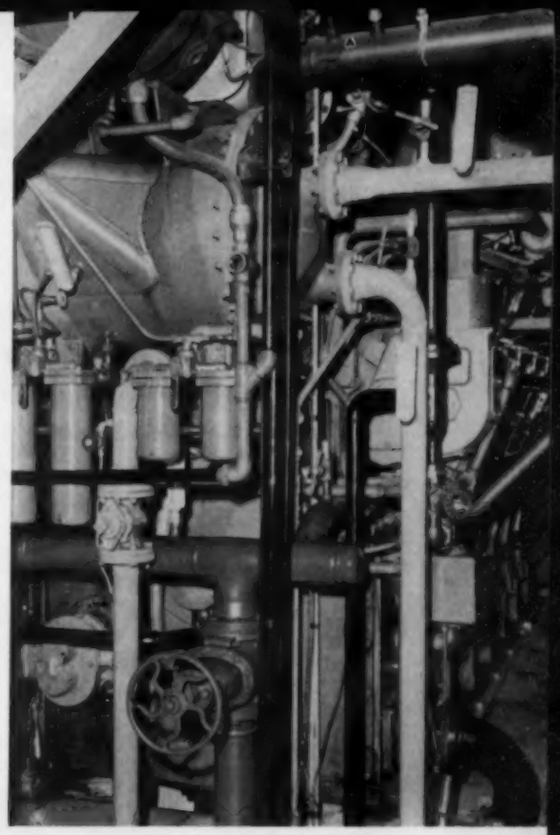


duced 2,476,650 kwh, 31 per cent of the plant's full year production of 7,901,200 kw hrs. The new unit consumed 176,610 gal. of fuel oil, an average of 14.02 kwh per gal. and raised the plant average from its 1958 level of 11.79 to a more attractive 12.31 kwh per gal. Figures for the first six months of 1960 reflect more accurately the weight of the new engine's efficiency. The Nordberg's output was 2,352,900 kwh, about 60 per cent of the plant total. Fuel consumption was 166,640 gal. for an average of 14.12 kwh per gal. This pushed the plant average up another notch to 13.11 or approximately 12 per cent better than the 1958 level.

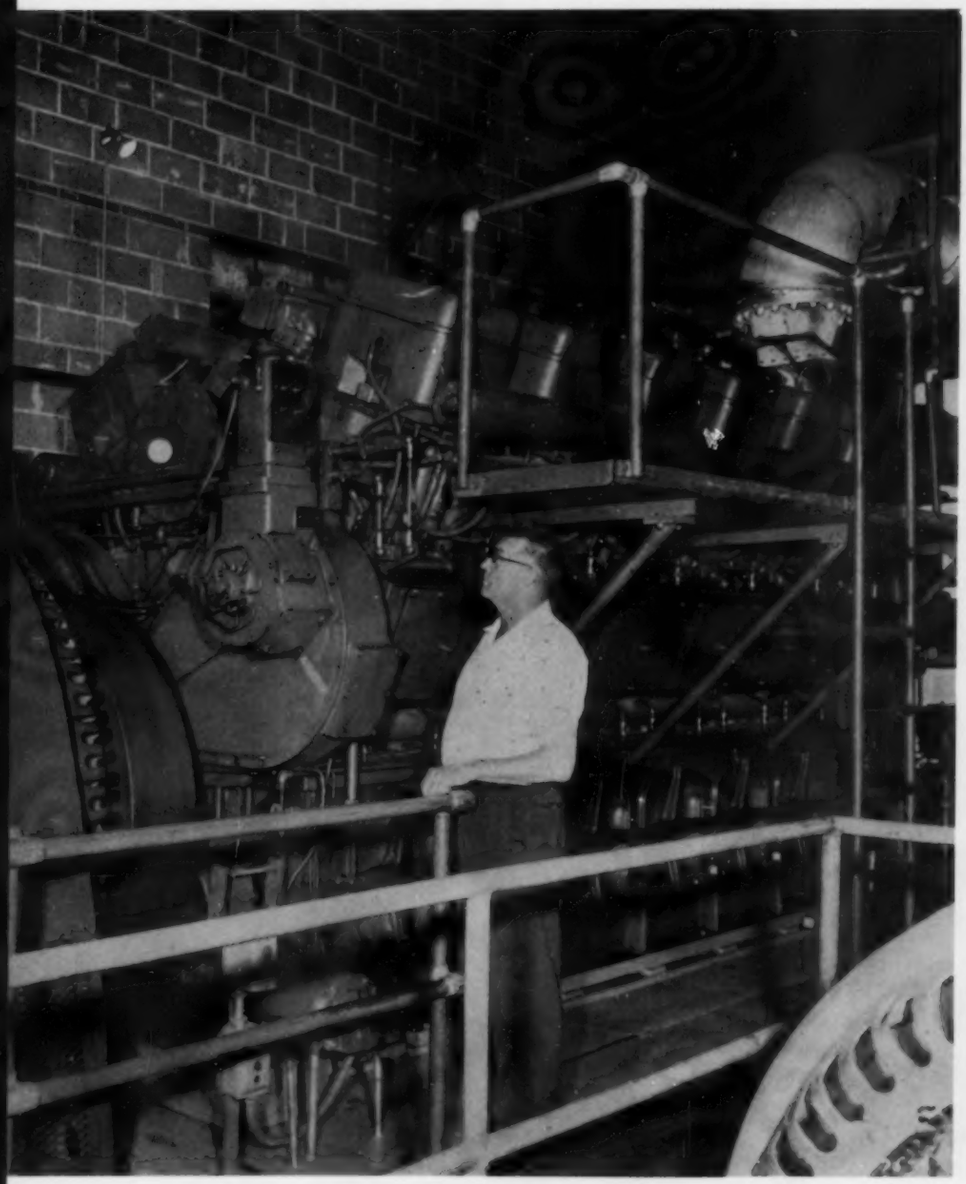
	Kilowatt-Hours		Gallons Fuel		Kw Hrs/Gal		Eng. Hrs.
	Nordberg	Total Plant	Nordberg	Total Plant	Nord.	Plant	Nord.
1958	—	6,940,583	—	589,150	—	11.79	—
1959	2,476,650	7,901,200	176,610	642,820	14.02	12.31	2,238
1960 (1960, 6 mos.)	2,352,900	3,946,200	166,640	301,070	14.12	13.11	2,171

The reduction in fuel costs helped boost profits in the fiscal year ended April 30, 1960. For that year, total sales of electricity brought in $193,645.84 and total operating expenses of the department were $152,831.08 leaving a net operating profit of $40,814.76. In addition, the plant provides free electricity for street lighting, city hall, the library, the park, free power for the water works and the sewage treatment plant.

Primarily, though, the plant is dedicated to providing dependable service at moderate rates to the 3,710 people who make their home in Waterloo and to additional residents in a widening perimeter. Industrial load means little and does not grow, for this is suburbia where the home is the focus of the community life. Load development at the rate of about 10 per cent a year has come as a result of new homes and greater domestic consumption. The summer peaks mean more air conditioning and they are nearly matched by the festive lights of Christmas time. The attractions of Waterloo as a place to live are accelerating the population growth and the plant is building to meet the challenge. The new generating equipment means greater capacity for service and greater operating economy. When cheap natural gas becomes available, the economy record will be further enhanced.



Since its installation in June 1959, the Supairthermal engine, operating on straight fuel oil, has averaged 14.07 kw hrs per gal of fuel. This view shows the Elliott turbocharger, Young intercooler, Nugent filters, and Roper main lube pump.



The Waterloo municipal electric plant is operated under the direction of Superintendent Raymond Hesterberg with policy supervision from Mayor Winget and the city council. The council's Light and Power Committee consists of Chairman Oscar Ebersohl, Lee Vogt, and Robert Lenhardt.

Principal Equipment Serving Nordberg Engine

Engine	Nordberg
Generator	Elliott
Turbocharger	Elliott
Governor	Woodward
Intercooler	Young
Fuel oil	Shell
Fuel injection pumps	Bendix-Scintilla
Fuel filters	Nugent
Lube oil	Gulf
Lube filter	Hilliard
Lube strainer	Elliott
Main lube pump	Roper
Auxiliary lube pump	Allis-Chalmers
Thermostatic valves	Amot
Jacket water pump	Allis-Chalmers
Raw water pump	Ingersoll-Rand
Exhaust snubber	Burgess-Manning
Air filter	American
Exhaust pyrometer	Alnor

CONTRACT MAINTENANCE BY ENGINE SPECIALISTS

Experienced Crews Can Be Moved Quickly To Any Location to Perform Maintenance. Emergency Repairs; National Marine Service Works in All User Fields

CONTRACT maintenance is not a new idea, but a growing organization located on the Mississippi above St. Louis is giving it a new meaning with a new approach. Directing its attention to operators of large diesel and natural gas engines and compressors, National Marine Service, Inc.—through its Hartford, Illinois Engineering Services Department, has organized and equipped highly experienced service crews, and is capable of moving them quickly to any location for contract maintenance or emergency repairs. According to Department Manager E. E. "Gene" Ahlemeyer, it's a logical take-off of the old saying, "if you can't move the mountain to Mohammed, you move . . ." Experience has shown the wisdom behind this. Moving independent, specially trained service men into the job site has resulted in very real "dollar economy" for oil and gas pipeline companies, municipalities and other heavy equipment operators both in reducing engine downtime and full time maintenance labor costs.

Because of the business being done among operators of stationary and mobile equipment, the company name of National Marine is somewhat of a misnomer. Ahlemeyer, however, quickly points to its origination and the Company's previous and continuing experience on the waterways as an important asset in broadening their business objectives. The Hartford facility was originally established to service vessels of its then parent company, Lake Tankers Corp., now National Marine Service, Inc. It is among the largest contract petroleum and bulk chemical carriers on the inland waterways. Other towboat and barge operating companies, realizing the value of this well located facility, were quick to take advantage of the services it provided in barge cleaning and gas freeing, vessel repairs, plus engine maintenance and parts replacement

Highly instrumental in establishing the Hartford facility was David A. Wright, president of National Marine Service. He, together with Ahlemeyer and superintendent of engineering, Vaughn C. Black in Hartford, are responsible for operations management, and the continuing growth of the Engineering Services side of the company. The facilities at Hartford are divided. Offices, engine parts

Two National Marine mechanics carry out emergency repairs on a tractor engine in the field. Firm has service force of 30 men with another 40 available "on call."

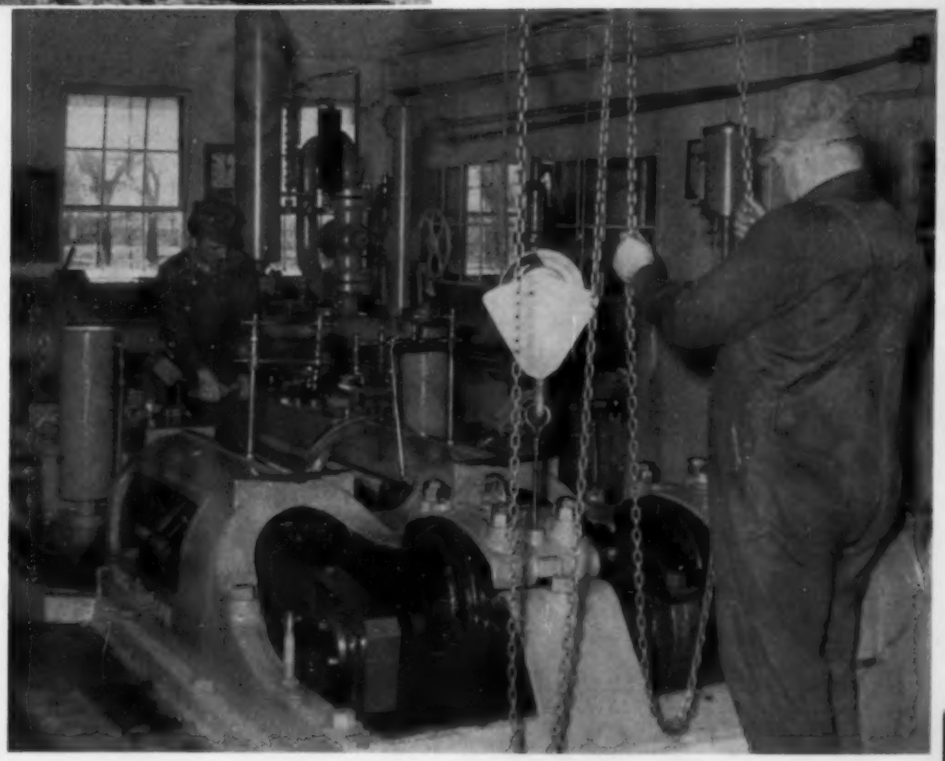
Van der Horst plated liner is loaded aboard company plane for quick transit to engine owner.

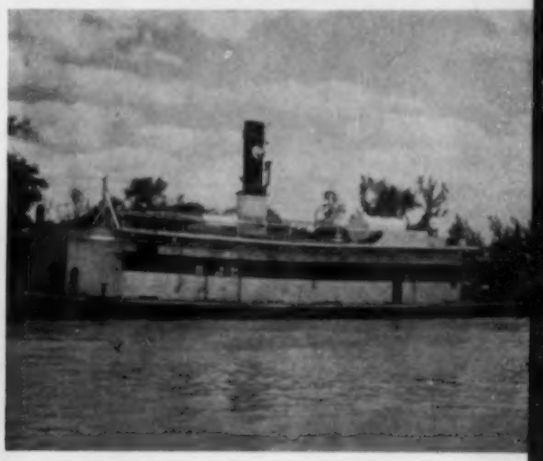
Company truck deliver parts to boat used to make midstream delivery to vessels.

course and then are assigned to work with veteran service people in the field. Presently, the permanent service force numbers 30 men, with an additional 40 available on an "on call" basis.

How does contract maintenance go to work for the operating company? Let's consider the program set up for a large southern refining company as fairly typical. Three years ago this company had two full time overhaul repair crews, one operating on either side of the Mississippi and each consisting of ten men. In total, these 20 men were responsible for 14 line stations, each with three to four engines per station. Overhaul time per station was averaging about eight weeks. Convinced that costs could be reduced, National Marine was engaged to handle the entire overhaul program. The refining company disbanded its crews, with the exception of two maintenance foremen, and these were assigned to work in close liaison with the stations regional inspectors and the National Marine center. A schedule was established, based on previous records and operating hours, that called for engine overhaul approximately every 30 months. National Marine, itself, was furnished with a tentative program the first of every year. Actual experience shows that with its specialized crews, numbering in this case four men and a foreman, National Marine is able to overhaul an entire station in about four weeks, working ten hours/day. The crews, if necessary, can be expanded to work 24 hrs. around-the-clock. The refining company furnishes all replacement parts, unless National Marine is specifically requested to do so, so all charges are based on just time on the job. Actual cost figures are not available for comparison purposes, but National Marine is now entering into its fourth year of service for this company.

Actually, what National Marine has done, is put highly skilled engine servicemen, ready for minor to major repair work, available on an immediate basis. So immediate, that the Company charters a plane and can have men and/or parts anywhere in the United States within 24 hours. As more pipeline stations and power plants go to complete automation with subsequent reduction in crews, it appears very likely that National Marine's concept of contract maintenance will keep growing.





Barge cleaning service is carried out with above equipment. This facility is equipped with high capacity boiler which provides a constant head of steam for cleaning. Barge compartments are cleaned for change of cargo or prior to repairs.

On the job at a pipeline pumping station field men work to put a centrifugal compressor back into service with minimum of downtime.

Office and shop of National Marine Service, Inc., Engineering Service Department is in this building at Hartford, Ill.

repair and testing equipment, replacement parts, storage and general warehousing are inland. Then, on the river, they maintain 1200 ft. of frontage with docks, steam-cleaning equipment and general ship-fitting and repair equipment. Now being fitted as a complete floating machine shop is a converted 205 ft. LSMR rocket ship acquired early in 1960. In building its staff of competent service engineers, National Marine has engaged men from its own towboat fleet, from power plants and trade schools. From here on in, according to Alemeyer, the men go through their own training

SPARK IGNITION NATURAL GAS ENGINE VERSIONS OF GM SERIES 71 DIESELS

Full Line of Two Cycle Spark Ignited Engines from 50 to over 1400 HP Plus Conversion Kits for Existing Diesels In the Field Are Offered by Stewart & Stevenson

By DWIGHT P. ROBISON

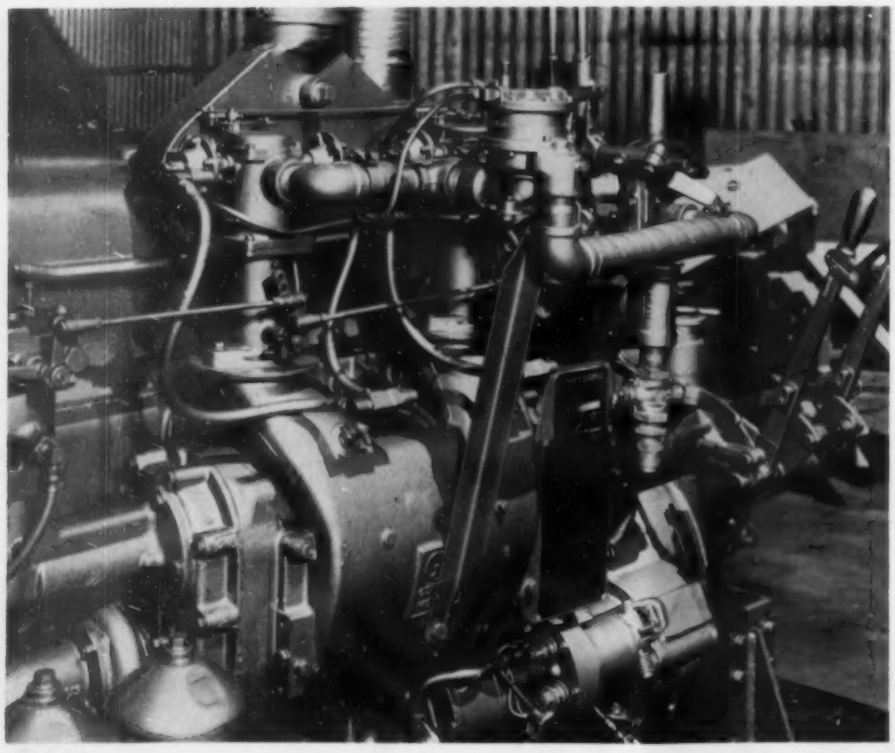
FOR many years, Stewart & Stevenson Services of Houston, Texas have recognized the desirability of a quick change-over from full diesel fuel oil operation to straight natural gas, spark ignited operation on the two cycle GM Series 71 engines. With this in mind, they have been working with various modification kits for Series 71 engine for more than three years to successfully convert these engines over to straight gas spark ignited operation.

After many months of experimenting with various arrangements, S & S engineers were able to run conclusive tests, which, at that time, indicated the desired qualifications for quick change-over from full diesel to straight gas operation and vice versa had been reached. To be sure that these accomplishments were correct and to gain more operating time and experience, a number of the Series 71 engines with the new conversion kits for straight gas operation were placed in the field. The applications on which these converted units were installed included irrigation pumps, generator sets and refrigeration service.

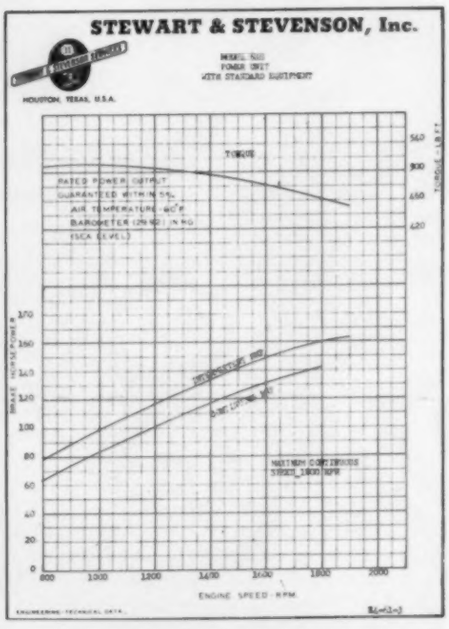
In addition to the field applications, one of the spark ignition conversion kits was installed on a model 6-71 General Motors diesel operating a generator in the Stewart & Stevenson plant. This particular operation gave the opportunity to observe the model 6-71 engine operating on straight natural gas under conditions of practically no load as well as full load, inasmuch as the load cycles from no load to full load were frequent and at periodic intervals. This installation and details of development work in progress on the engine were presented in the May 1960 issue of DIESEL AND GAS ENGINE PROGRESS.

The information obtained from these tests proved to be invaluable, since the results of the extensive field testing showed that certain problems existed in not only the first approach, but also the second conversion kit application. The problems were centered around two major areas. One was in the spark plug adaptor itself, wherein heat problems around the spark plug developed. This called for an entirely new design which was developed and incorporated direct cooling water contact with the adaptor. This change combined with a change in the cylinder head affecting the

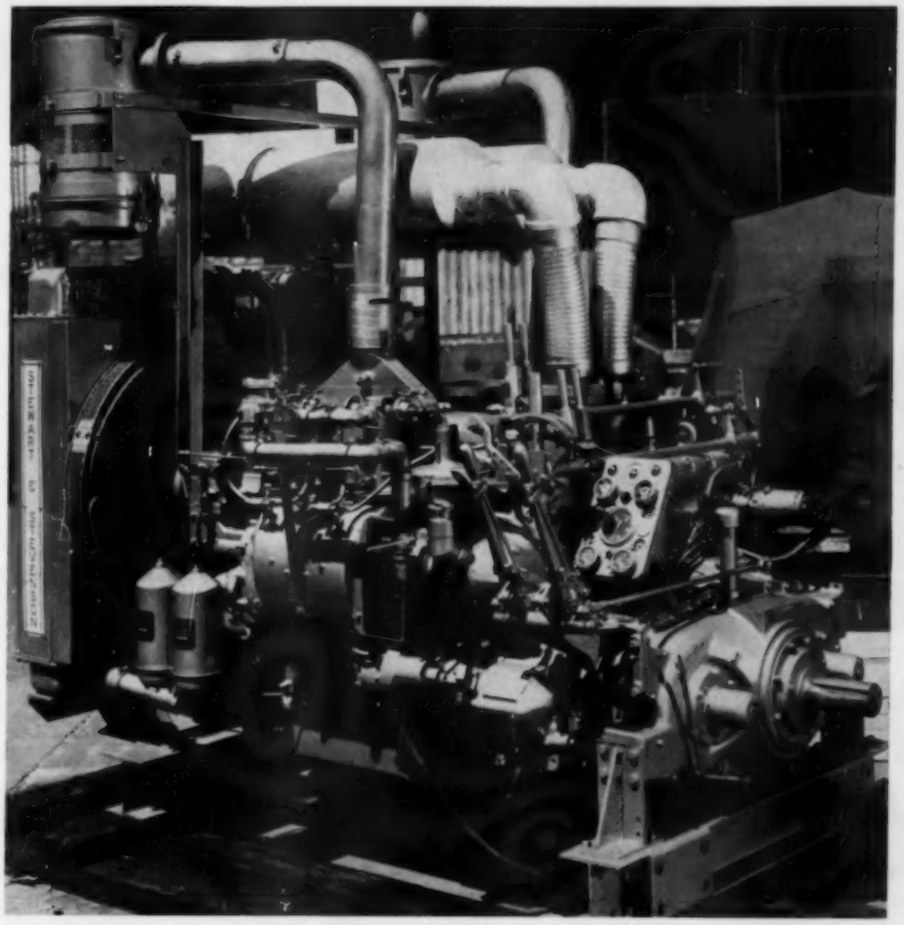
Closeup of the spark ignition conversion installation on a GM 6-71 engine. Note the dual Ensign natural gas carburetors, carburetor and throttle control arrangement in conjunction with Woodward governor, and valve assembly on carburetor and engine blower for control of fuel to air ratio and balance of air system in the two cycle engine.



Performance curve of the 6-71 spark ignition gas engine.



Model 12103 GM Twin 6-71 engine unit with Stewart & Stevenson spark ignition kit installed.



combustion chamber resulted in increasing spark plug life by more than three times.

The other major problem was in controlling the performance and fuel economy to include a wide range of speeds. This required a change in the original design and included dual carburetion on the six cylinder and larger models plus closer controlled fuel to air ratio and a change in the compression ratio. These and other minor changes have made possible the operation of the new spark ignited Series 71 engines over a range of speeds of from 800 to 1800 rpm. Fuel economy is reported excellent as well as acceleration, response to sudden load changes and lugging ability.

The continuous horsepower rating is the same on natural gas operation as on straight diesel. Stewart & Stevenson is now offering a complete line of spark ignited, GM Series 71 engines varying from 50 to 1400 hp. In addition, conversion kits for existing Series 71 GM diesels are also available. These conversion kits are made up of relatively few parts. For example, to convert a model 6-71 GM diesel over to spark ignited natural gas operation, the kit would consist of the following major parts:

1. An exchange cylinder head complete with spark plugs and adaptors.
2. Natural gas carburetor with attaching adaptor for installation on engine blower.
3. A special valve assembly for partial automatic fuel to air ratio balance and adjustment.
4. Carburetor to air cleaner adaptor.
5. Magneto or distributor ignition set with wires.
6. Necessary linkage from governor to carburetor and throttle control.
7. Single, back fire arrestor.

The time required to install the equipment on a Model 6-71 diesel is approximately four to five hours.

The ease of interchangeability between diesel and spark ignited natural gas operation with these engines is an important advantage as it permits the engine user to operate the same engine on either diesel fuel or natural gas, whichever is the most economical. This allows an excellent flexibility in adapting the engine to best suit the application and availability of fuel. Natural gas engines have wide usage today and excellent prospects for the future. The conversion of the GM Series 71 engine line by Stewart & Stevenson to successfully burn natural gas is another important step forward in the development of wider ranges of engine models for natural gas operation by heavy duty engine builders in this country.

MODEL 3SG

Horsepower	50 to 76
Number of Cylinders	3
RPM (Continuous Duty)	1200 to 1800
Weight	1600 lbs., approx.

MODEL 4SG

Horsepower	63 to 107
Number of Cylinders	4
RPM (Continuous Duty)	1200 to 1800
Weight	1800 lbs., approx.

MODEL 6SG

Horsepower	100 to 163
Number of Cylinders	6
RPM (Continuous Duty)	1200 to 1800
Weight	2150 lbs., approx.

MODEL TWIN 4SG

Horsepower	125 to 212
Number of Cylinders	8
RPM (Continuous Duty)	1200 to 1800
Weight	5000 lbs., approx.

MODEL 8VSG

Horsepower	135 to 250
Number of Cylinders	8
RPM (Continuous Duty)	1200 to 1800
Weight	2550 lbs., approx.

MODEL TWIN 6SG

Horsepower	200 to 326
Number of Cylinders	12
RPM (Continuous Duty)	1200 to 1800
Weight	5700 lbs., approx.

MODEL 12VSG

Horsepower	200 to 360
Number of Cylinders	12
RPM (Continuous Duty)	1200 to 1800
Weight	3300 lbs., approx.

MODEL 16VSG

Horsepower	275 to 500
Number of Cylinders	16
RPM (Continuous Duty)	1200 to 1800
Weight	5800 lbs., approx.

MODEL QUAD 6SG

Horsepower	400 to 650
Number of Cylinders	24
RPM (Continuous Duty)	1200 to 1800
Weight	12500 lbs., approx.

MODEL TWIN 12VSG

Horsepower	400 to 720
Number of Cylinders	24
RPM (Continuous Duty)	1200 to 1800
Weight	13500 lbs., approx.

MODEL TWIN 16VSG

Horsepower	550 to 1000
Number of Cylinders	32
RPM (Continuous Duty)	1200 to 1800
Weight	17800 lbs., approx.

MODEL QUAD 12VSG

Horsepower	800 to 1440
Number of Cylinders	48
RPM (Continuous Duty)	1200 to 1800
Weight	26000 lbs., approx.

Table showing the ratings of the various spark ignited models offered.

NEW FUEL OIL DEVELOPED FOR HIGH SPEED DIESELS

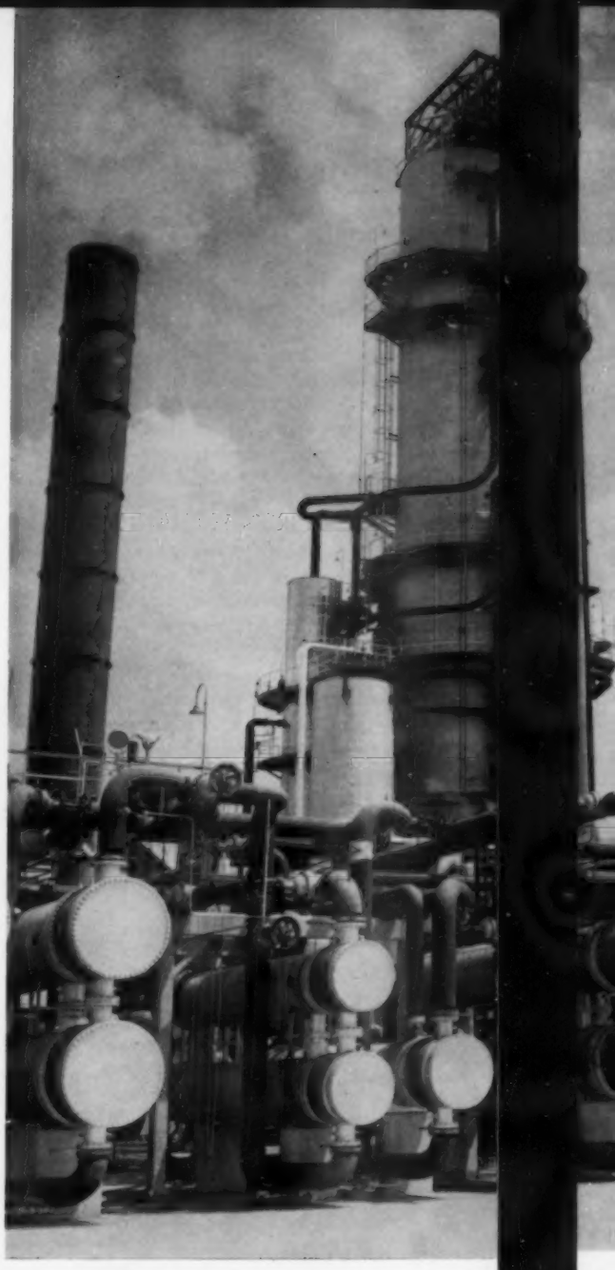
By ROBERT E. SCHULZ

EMPHASIS on lower operating and service costs stretches all the way from the engine builder and equipment manufacturer to the user. And, in between are some very important suppliers whose products do much to keep the lid on these costs. The oil companies are one such group and individually and collectively they have consistently worked in the interest of the diesel operator. In this article we cover a new diesel fuel tradenamed American Premier. This is a product developed by the American Oil Company, an affiliate of Standard Oil Company (Indiana) for the Standard Oil Division, and is being planned for marketing nationally by all of American Oil's sales divisions.

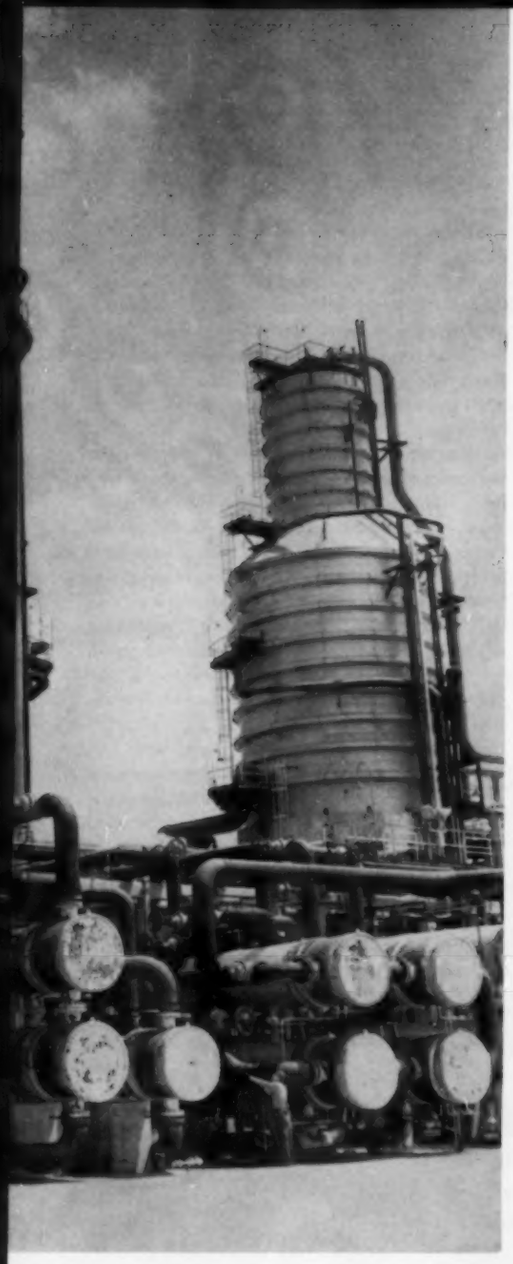
What's behind the development of American Premier diesel fuel—what needs does it satisfy? The answer is concise. Based on user reports from many different territories, the engineering and sales staff of American Oil Company was convinced that a definite need existed in its product line for a diesel fuel of uniform specifications. A diesel fuel that would be the same high quality 365 days a year, wherever it was purchased, consistent with area climatic requirement. Equally important, was the express need that this fuel be specially tailored to modern high speed diesels used in farm, highway, construction, marine and similar heavy duty operations. This the American Oil Co. has achieved with Premier, a totally new constant quality fuel that for identification has been given a distinctive red color.

Many of the advantages of a special diesel fuel have been established. Over and above its consistent quality and availability, American Oil points to customer reports of increased power through better performance, and reduction in service costs by extending overhaul periods. Looking generally at the specifications, Premier has a high cetane to primarily assure good engine starting. Volatility is correctly balanced and carefully controlled to reduce smoke, odor, and carbon deposits while maintaining high power output. Viscosity, while not a critical requirement since most present-day injection systems will handle either No. 1 or No. 2 fuels satisfactorily, is maintained high enough to provide good lubrication, prevent seepage past plungers to assure good spray penetration and injection of a full fuel charge. Premier has a low sulfur content that aids in reducing ring and piston deposits and corrosive wear on cylinders and rings, plus helping prevent deterioration of oil in the crankcase.

A multipurpose fuel additive plays an important role in tailoring Premier exclusively for high speed diesel use. Anti-rust ability protects the main fuel storage tanks and the equipment's fuel system, including pumps and injectors from rusting caused by moisture. This is particularly applicable in farm tractors and construction equipment which is often used seasonally and then put into storage for extended periods. Even with very high stability, American Oil's additive provides oxidation in-



Cote Farms Foreman Maynard Belanger (left) and Manager Clarence Romein discuss operating costs. Below, Foreman Belanger fuels 65 hp Hercules diesel driven Cockshutt tractor with American Premier. Farm stores 2000 gals. in underground tanks.



American Oil Co. operates one of the world's largest crude oil pipe stills at its Whiting, Ind. refinery. All Premier diesel fuel produced by the Standard Oil Division passes through this unit. Design capacity is 140,000 bbls. a stream day.

hibition which, in addition to further stabilizing the fuel against oxidation, assists in preventing formation of varnish and gum deposits that are normally accelerated by moisture, long periods of storage and fluctuating temperatures. Another property is detergency to improve fuel filter life and reduce injector sticking often caused by organic varnish-like deposits frequently due to overheating and accidental contamination.

To get a good look at Premier in action, we went into the field to contact some users of the new diesel fuel. We stopped at Cote Farms at St. Anne, Ill., which is only 10 mi. from Kankakee. With 2,500 acres under plow, this farm is among the largest in the state. During 1960 its acreage was in corn, yielding 85 bushels/acre, shelled and dried. Managed by Clarence Romein, Cote Farms operates 10 diesel wheel-type tractors—six row crops and four general purpose—an average of 800 hrs. each per year. It is serviced out of St. Anne by Standard Oil Div. agent Jack Russell.

Farm manager Romein told us, "We've been using Premier since May of '60 and the most important advantage we've found is reduced fuel consumption. During the heavy part of the season, the tractors are out 10 to 13 hours a day, and we've been averaging about 3 gals./hr./tractor. Considering that we normally burn some 35,000 gals. of diesel fuel a year, economy is a mighty important factor." At that point we were joined by Maynard Belanger, the farm's foreman who has been with Cote for 27 years. Belanger and his crew take charge of all tractor and equipment maintenance in addition to their regular farm duties. Talking about Premier, he pointed to lower pump maintenance, easier setting of the pump racks, plus less nozzle problems. Cote stores its fuel oil in 2000 gal. capacity underground tanks.

Turning then to a large fleet operator, we contacted the main office of Buckingham Freight Lines in Des Moines, Ia. Buckingham owns and operates 207 diesel OTR tractors including Internationals, White Freightliners and Kenworths, all of which are powered by Cummins diesels. Buckingham has been established in the trucking field since 1930. Its main routes are from Chicago to the Pacific Northwest and Canada and recently, to give greater coverage in Montana, Washington and Oregon, Buckingham merged with United Truck Lines, Inc. Indicative of their widespread service, in the first nine months of 1960 Buckingham trucks logged over 15 million miles carrying 398,000 tons of freight. Even with much of their mileage in heavily mountainous areas, the diesel tractors averaged slightly over 5 mpg.

According to William Lindholm, superintendent of maintenance and Ken Wenner, shop superintendent, the company started using American Premier diesel fuel in early 1960, and since that time the number of low power complaints from the drivers have dropped noticeably. "Diesels coming in for scheduled overhaul at 300,000 miles," states Lindholm, "are definitely cleaner—which in my way of thinking means better combustion and economy for the engines and more power to the drivers." Both Lindholm and Wenner noted that there has been no problem with diesel pumps and injectors sticking, plugging, or scoring during their regular 150,000 miles service program.

Buckingham uses available American Oil Company truck stops where they do not have their own terminal fuel storage facilities. In 1960 the company purchased approximately 3,220,000 gals. of American Premier.

Specifications governing production of Premier are now in the hands of all American Oil Company's refineries and procedures are being established to assure uniform quality. Presently American Premier is available at all midwest area Standard Oil Division authorized truck stops, bulk plants and storage depots. According to Company officials, it will shortly be ready for marketing in the Salt Lake City area.

Top—One of Buckingham's White Freightliners fuels with American Premier at the Town & Country Truck Stop north of Des Moines, Ia. Right — William Lindholm, superintendent of maintenance for Buckingham (left) and the company's shop superintendent Ken Wenner (right) at the Premier pump outside of Carrier's garage in Des Moines.

Gardner-Denver SP900 Rota-Screw compressor in action. 900 cfm compressor is powered by Caterpillar D343, turbocharged diesel engine driving through Twin Disc ring-type coupling.

NEW PORTABLE ROTARY SCREW COMPRESSOR LINE

By ROBERT E. SCHULZ

QUINCY, ILL.—Here at the Gardner-Denver plant three new portable air compressors ranging from 125 to 900 cfm are being wheeled off the production floor. These compressors are totally different in design and operating concept from any of the company's previous models. Called "Rota Screw," the machines take their name from a highly-efficient screw-type air compressor developed and built by Gardner-Denver. Also new to the portable line is the application of Caterpillar diesels. Selected to power the 600 and 900 cfm portables respectively are the Cat D333 and D343, turbocharged engines which themselves were introduced within the last year. To accommodate these engine-compressor combinations, G-D has redesigned its entire package and in doing so added important new operating and control features. Thus this first-hand report from Quincy on my meeting with some of the company's engineering and sales officials.

Aside from the characteristic metallic green finish, operators of previous G-D portables will find little of similarity in the new machines. Though trimmer in appearance and providing greater accessibility, the compressors however have not materially changed in overall dimensions and weight (the 900 cfm machine weighs 15,100 lbs.) G-D engineers have designed for fast job setup and the compressors can be operated off-level, at an angle, uphill or downhill. For fast transportability, extra heavy running gear and automotive-type steering is employed. Also key elements in the design are easy starting and immediate load pickup, simplified controls and fail-safe electrical system.

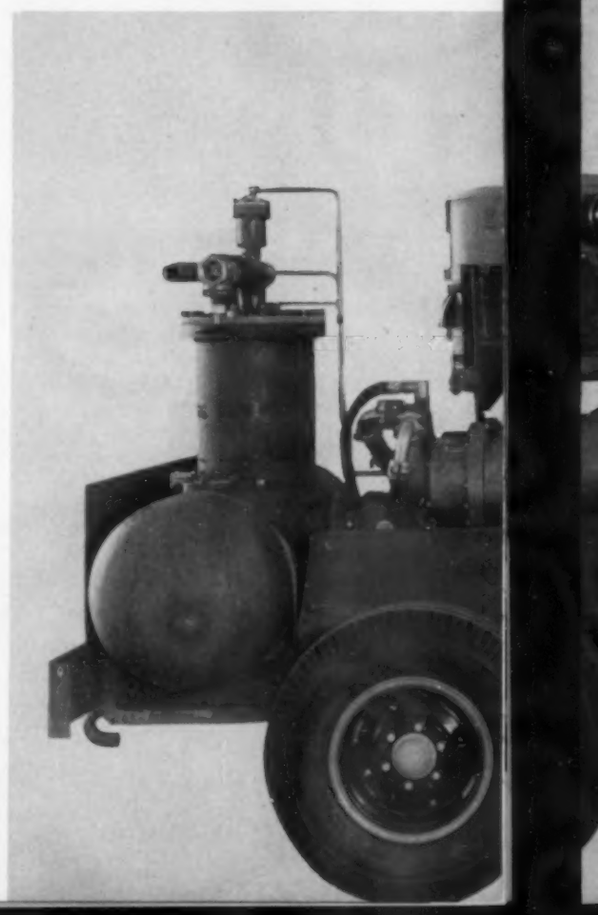
Heart of the new units, of course, is the new screw-type air compressor. Thoroughly tested and proved, it replaces the vane type rotary which has been well established in the G-D line for many years. Noting the picture of the compressor with its cover off, air entering the intake port is drawn into the space between lobes of the two helical rotors. The revolving rotors force air into successively smaller interlobal spaces, compressing the air in a single stage until full compression is reached. As air is expelled, the next groove comes into line with the outlet port to assure smooth free-flowing air without pulsation.

Designed to operate in a wide range of ambient temperatures (–40° to 115° F.), the Rota Screw has no wearing parts within the compressor chamber. The two rotors are separated by the timing gears and are oil flooded for sealing and heat removal in compression. Operating pressure of all three of the models is 100 psi at 1800 rpm.

At Quincy I had a very good look at the Caterpillar powered SP600 (600 cfm) and SP900 (900 cfm) machines both in assembly and in operation. A third and smaller unit, the SP125, is driven by a Continental gasoline engine and a diesel option is expected later. Both Caterpillar diesels are four-cycle, six cylinder, turbocharged engines. They are part of a new line of high performance engines that are being well received in the field. The D333 powering the SP600 has a 4.5 x 5.5 in. bore and stroke, 525 cu. in. displacement and 18:1 compression ratio. The D343 with overhead cam has a 5.4 in. bore and 6.5 in. stroke, piston displacement of 893 cu. in. and a 16:1 compression ratio. For more details on their design and operating features I refer you to the June, 1960 and February, 1961 issues of DIESEL AND GAS ENGINE PROGRESS.

A four-point mounting is used for the diesels; the compressors mount at three points. The diesels drive through a Twin Disc rubber block shock-absorbing coupling as illustrated. This type of drive provides smooth power transmission and effectively compensates for limited angular and parallel misalignment caused by towing over rough terrain. The driving member consists of a driving ring into which large internal gear teeth are cut. Synthetic rubber blocks or "teeth" are mounted on the driven spider and molded to the involute form of the coupling.

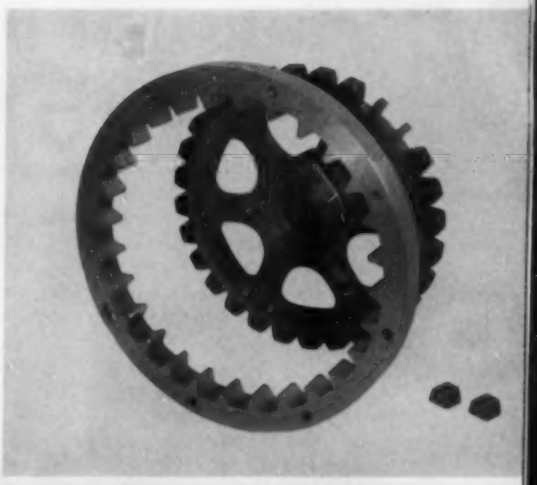
Starting, control and shutdown systems on the portables are well planned from both a simplicity and an efficiency standpoint. Glow plugs are used in the pre-cups of the Cat diesels and for cold-weather starting, an AC ether system is installed. Starting switch and gauges for air receiver pressure, water temperature, amperes, and lube oil pressure are panel-mounted at the engine manifold level for both easy reading and access. When started, the engine speed is controlled by a G-D designed "thrift-meter," an air demand sensing device in the receiver that controls throttle linkage



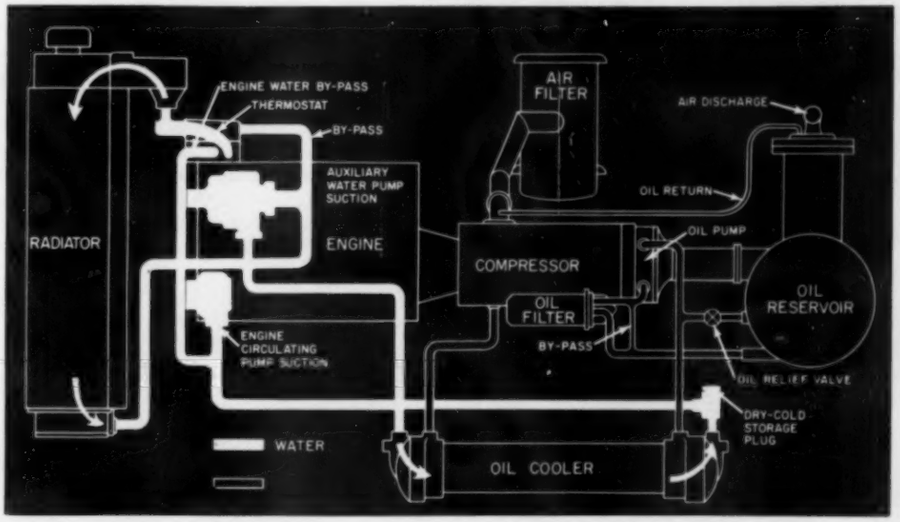
and engine speed for most economical fuel consumption. Rpm of the engine varies from 1100 at idle to 1800 at full load. The compressor is also equipped with a fail-safe electrical system including a low lube oil pressure sensing switch, a high water temperature switch and a high air discharge switch—any one of which will cause complete engine shutdown. Also, upon shutdown, either normal or emergency, the receiver of the compressor is immediately purged of air.

Water and compressor cooling oil system is a special feature of the new portables and it is illustrated diagrammatically. This system provides constant operating temperature for both engine and compressor under all climatic conditions. Also it is so designed to keep water and oil temperatures within 20° of each other with discharge air temperature normally between 170° and 190° F. In the system a seven-pass Yates-American radiator of the de-aerating type is used in conjunction with an identical make compressor oil heat exchanger. Modulating type thermostats are used in the cooling water system to assure rapid warmup from cold starts and also to maintain desired temperatures during various operating conditions.

Twin Disc rubber block shock-absorbing coupling connects engine and compressor in Gardner-Denver units.

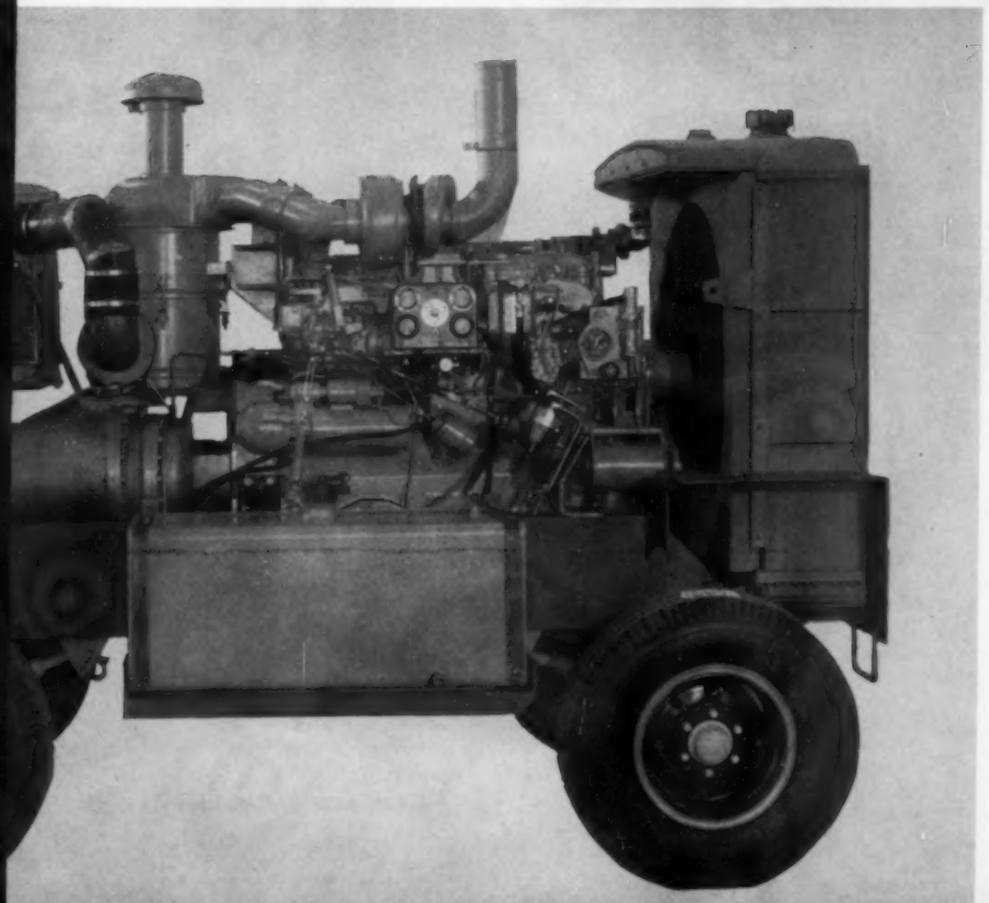


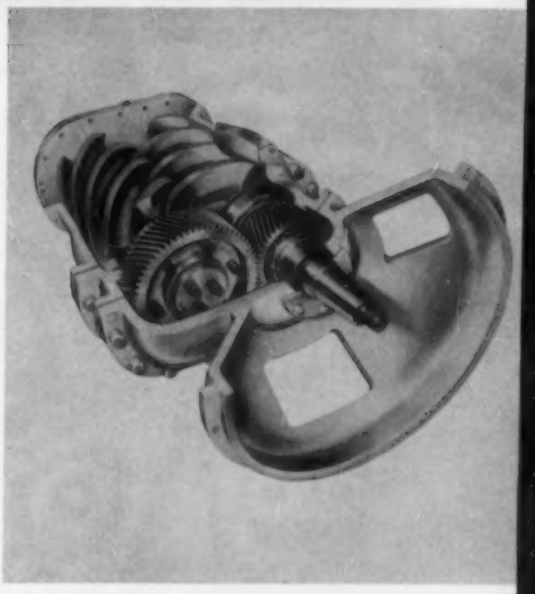
As already noted, the compressor rotors are oil-flooded to seal air in, and this oil also removes the heat of compression. Compressed air and oil from the compressor discharges into a combination air receiver and oil reservoir where primary separation is effected in a spill pipe. Then this mixture passes to an internally contained Air-Maze separator where the balance of the oil is removed. From the reservoir, the compressor oil is pumped to a bypass filter, through the heat exchanger and back to the Rota Screw compressor.



Cooling system diagram for water and compressor oil. Reservoir has Air-Maze separator and Nugent by-pass filter is used in oil system with Yates-American heat exchanger.

Open view of 600 cfm portable shows Cat D333 diesel and drive arrangement. Note control grouping. Radiator is Yates-American seven-pass type and electrical equipment Delco-Remy and turbocharger is Schwitzer. Twin Donaldson dry-type air cleaners serve engine and compressor.





Compressor rotors are separated by timing gears and held to precise clearances between rotors and casing by heavy-duty bearings. There is no metal-to-metal contact in compressor chamber.

DIESEL PILE HAMMERS SPEED EXPRESSWAY JOB

FROM the Tulip Festival town of Holland, Mich., comes another report of the latest in a series that signal the modern trend in pile driving . . . the switch from air and steam to self-contained diesel driven pile hammers. L. W. Lamb Co., Holland area contractors, replaced their steam hammer with a new diesel hammer for work on the Grand Rapids Expressway job, driving 42 ft. long spiral-welded tube piling, 12 in. in diameter, down to 40 ton bearing. To reach this bearing in the heavy clay soil, each pile was driven approx. 39 ft. into the ground. Using a Link-Belt model 520 diesel hammer rated up to 30,000 ft. lbs. per blow, it took only two shifts to drive the specified 60 piles. And fuel consumption amounted to an average of just 10 gallons per shift.

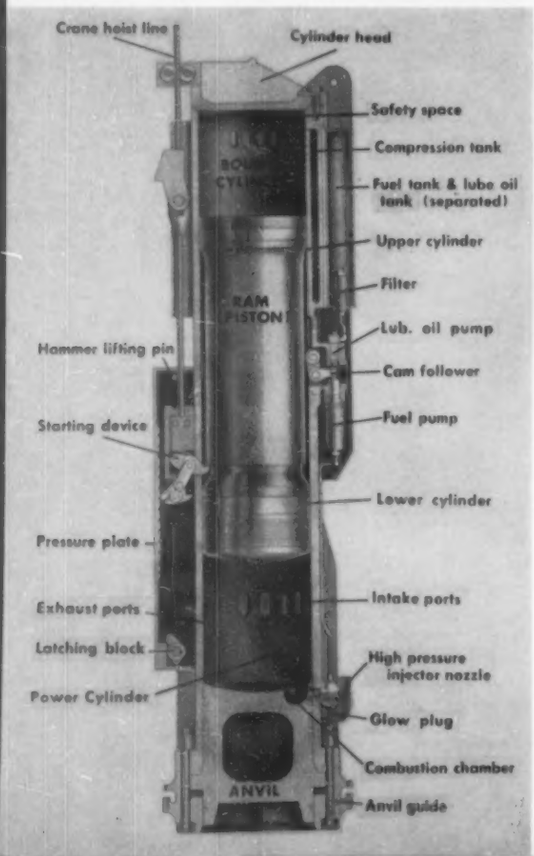
Diesel pile hammers have presented a strong challenge to the commonly accepted pile driving techniques in the past 20 years. (See DIESEL AND GAS ENGINE PROGRESS, May 1960.) Drop hammers, already outlawed in some locations, are rapidly passing from the construction picture. Steam and air hammers, though still much in evidence, are beginning to feel the tightening squeeze by diesel hammer applications. There's no mystery surrounding this popularity, for diesel hammers have not only matched but surpassed driving efficiency of both steam and air. More important, they have eliminated the need for costly auxiliary equipment such as compressors, boilers, high pressure hoses, fresh water supply and others.

The Link-Belt Speeder hammer, such as used by L. W. Lamb Co., on the Grand Rapids Expressways project, has a design somewhat unique among diesel pile hammers. First of all, one man can control both crane and hammer from the crane cab. Then too, the enclosed head eliminates the possibility of "launching" the ram right through the top of the cylinder and prevents dirt and other foreign material from entering and scoring the ram or cylinder walls. The enclosed head also acts as an "air spring" aiding gravity in the downward stroke and almost doubling the blows per minute. More reliable firing is assured through use of high pressure fuel injection and a glow plug allows quick warmup in the combustion chamber for cold weather starting or in soft going.

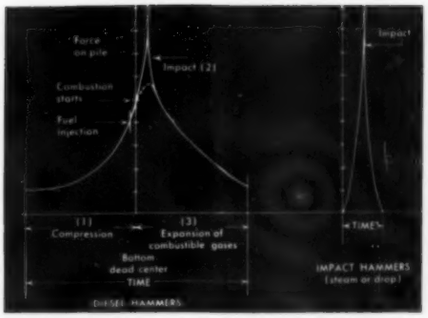
The Link-Belt Speeder diesel hammer is a self-contained, free piston, unit operating on the two

Pile hammer is controlled from single lever at operator's extreme left in photo at right. This model 312 Link-Belt Speeder diesel hammer was in use on Grand Rapids Expressway.

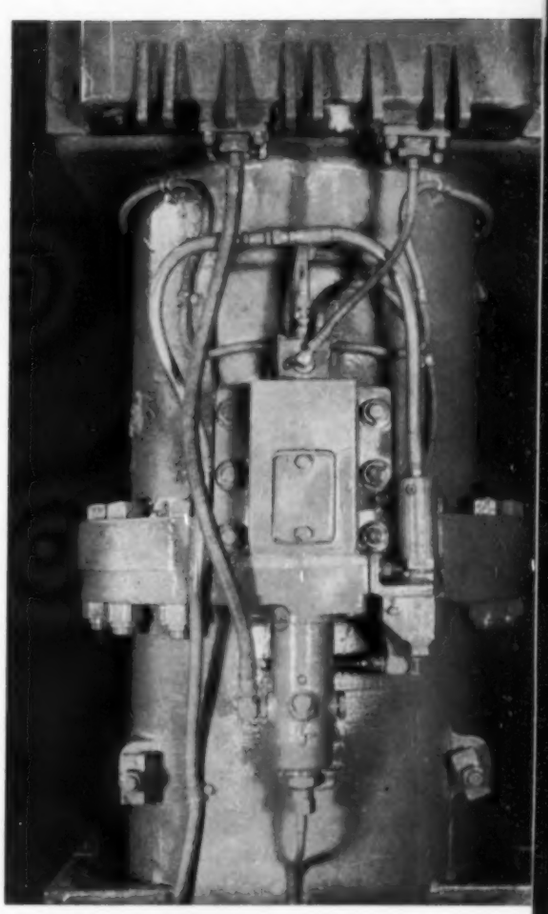
Cross section drawing of Link-Belt Speeder hammer shows enclosed head construction. Rings on upper and lower end of the ram are by Koppers Co.



Portions of Grand Rapids Expressways job required work in close quarters as above. Diesel pile hammers self-contained features do away with need for auxiliary equipment.



Graph shows greater sustained driving time per cycle delivered by diesel hammer as compared with impact units.



Exterior view of hammer cylinder shows American Bosch APF fuel pump, lower, lube pump at upper center, lube filter, top right and fuel filter, at top left end of hoses.

cycle principle. In contrast to the drop, steam or air hammer, which delivers its work output totally in impact, the diesel hammer delivers its work in three energy forces: preloading by compression, impact, and expansion of combustion gases. (See cut.) The hammers consist of the following major parts: the cylinder, in two parts; ram (or piston), anvil, anvil guides, cylinder head, mechanical starting device, lube oil pump, and fuel injection equipment. (See cross section cut.) The power stroke of the hammer, from point of impact to exhaust ports, is approx. ⅓ of the maximum obtainable stroke of the ram. The air compressor at the upper end of the cylinder consists of the bounce cylinder and compression tank, and operates for the full stroke of the ram. Two compression tanks are located outside the upper cylinder and are connected to the cylinder by ports. The pressure of the entrapped air within these tanks is used to shorten the stroke of the ram and results in nearly double the number of strokes per minute. The energy of the compressed air stored in the bounce cylinder and the compression tanks acts as an air spring to push and accelerate the ram on its downward stroke. The ram is lifted by the force of expanding gases from the burning fuel and air between ram and anvil.

To start, the ram is lifted by a single crane hoist line, compressing air between the top of the ram and the enclosed cylinder top and in the air compression tanks located on the outside of the cylinder proper. The ram is dropped and accelerated downward by gravity and the expansion of the air in the compression tank. During the downward stroke, the ram forces a mixture of air and residual gases through the ports, closes off the exhaust ports, and compresses the trapped air mixture in the power cylinder between the bottom of the ram and the anvil. The compression of the trapped air mixture creates a pre-loading force on the anvil and the pile. As the ram nears the end of its down stroke, it triggers a cam-operated fuel pump which injects atomized fuel under high pressure into the combustion chambers in the top of the anvil. The ram strikes the anvil, delivering its impact energy to the pile. Then the combustive gases ignite (due to the high compression temperature) and expand or explode driving the ram upward and pile downward, adding a push to the pile and extending the time that the pile is in motion.

On the up-stroke the ram uncovers the exhaust port, allowing the gases to "blow-down," then draws in fresh air through the intake port as it continues upward, simultaneously compressing the air in the tank to complete the cycle. The ram, on its upstroke, also actuates the cam operated lubricating oil pump.

Fuel oil is supplied to the American Bosch APF injection pump by gravity flow from the fuel tank. A replaceable Cuno filter element is mounted inside the fuel tank for maximum protection against damage. The injection pump is operated by the bell crank lever and cam follower which has a roller contacting the machined form on the upper part of the ram. The injectors, each consisting of American Bosch type ADN pintle nozzle and AKB nozzle holder are located at the lower end of the cylinder and inject fuel directly into the spherical shaped combustion chambers in the anvil. Lubrication is by a single plunger pump operated by the same bell crank lever on the ram upstroke.

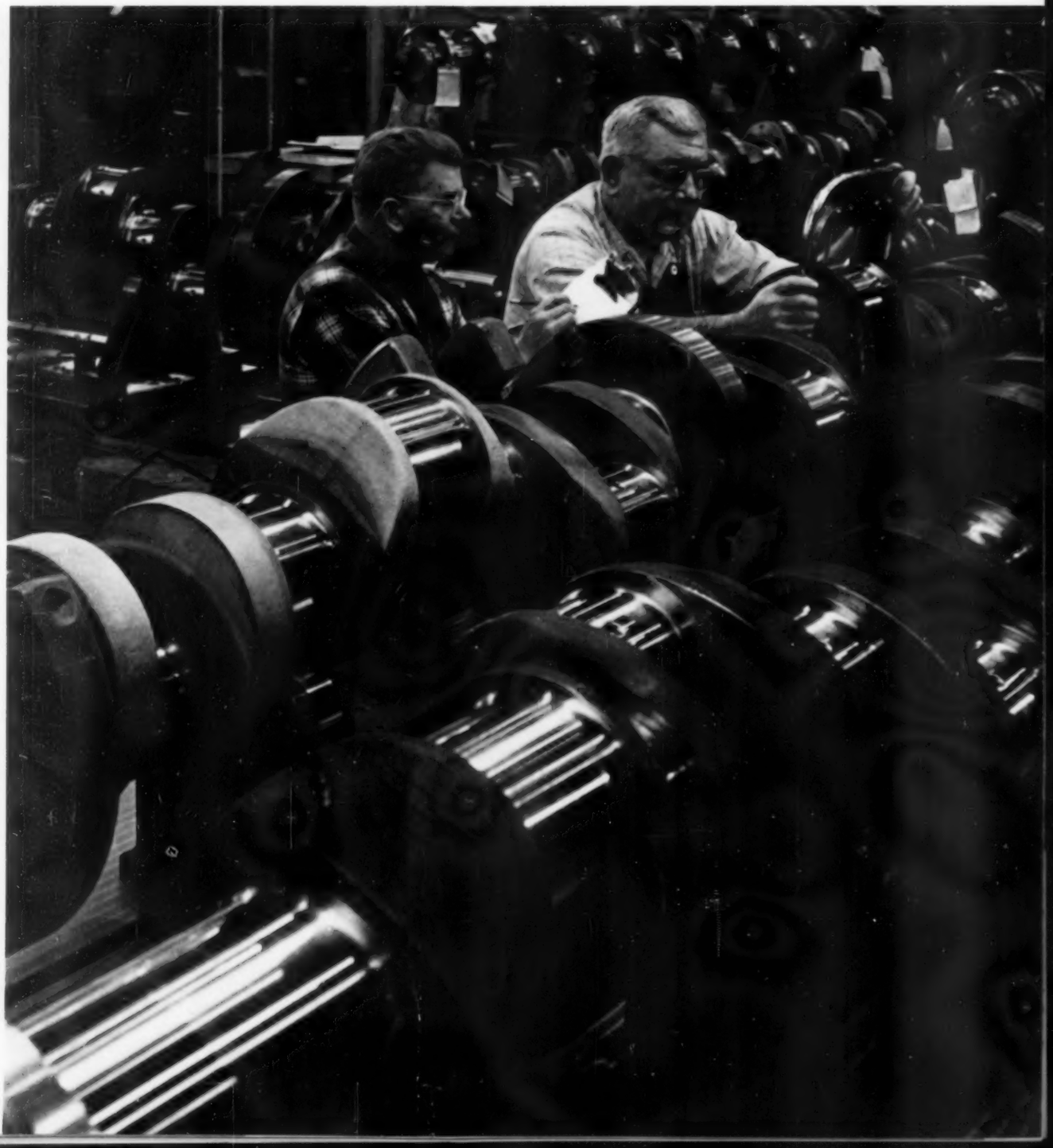
The hammer is equipped with hydraulic controls to vary the amount of fuel delivered by the fuel pump. Controls consist of the transmitter at ground level connected by means of an hydraulic hose to a receiver mounted on the hammer. The receiver actuates the bell crank lever which in turn operates the fuel pump control rack.

Maximum equivalent output of the Link-Belt Speeder diesel hammers are up to 7,500 ft. lbs., for the model 105; to 18,000 ft. lbs. for the model 312 and up to 30,000 ft. lbs. for the model 520. Output of these hammers can be determined by use of a gauge developed especially for the unit. Since the Link-Belt hammer has an enclosed cylinder head, it is impractical to measure visually the length of the stroke. Other diesel pile hammers have open cylinder head and single acting steam or air hammers have a fixed stroke, making it possible in either case to rate them by the familiar WH formula . . . weight of ram x length of stroke.

The new output gauge rates the Link-Belt hammer by means of a gauge connected through a hose to the compression tank. The gauge records the pressure which can be converted (by a graph) to the equivalent WH rating (in ft. lbs.) by combining the actual ram stroke, plus the extra "air spring" energy in the upper part of the cylinder. The resulting evaluation is conservative since the driving effect of fuel combustion is not considered.

Electro-Motive announces
new facilities for complete

CRANKSHAFT REMANUFACTURING



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ELECTRO-MOTIVE DIVISION · GENERAL MOTORS
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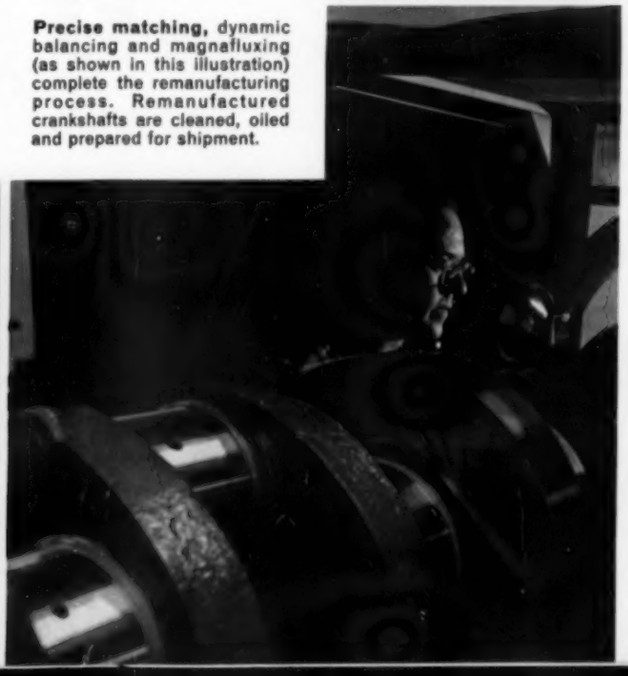
Crankshafts are first thoroughly cleaned and given a polish to facilitate inspection. *When necessary,* damaged tapered ends are replaced, counterweights added, couplings straightened, pilot concentricity restored.

Precision equipment such as this straightening press, as well as special equipment for stress relieving, magnaflux inspections, controlled shot peening are all utilized in Electro-Motive's complete remanufacturing process.

Scientifically controlled plating assures correct addition of chromium for maximum strength and durability. After plating, shafts are cleaned under pressure, ground and polished to new tolerances.

Precise matching, dynamic balancing and magnafluxing (as shown in this illustration) complete the remanufacturing process. Remanufactured crankshafts are cleaned, oiled and prepared for shipment.



NEW CONTAINERSHIPS IN EAST COAST SERVICE

New Members of the U.S. Merchant Fleet Carry Cargo Between New York and Florida Ports; Vessels Are First New American Flag-Ships to be Built for this Coastwise Route Since 1930

By ED DENNIS

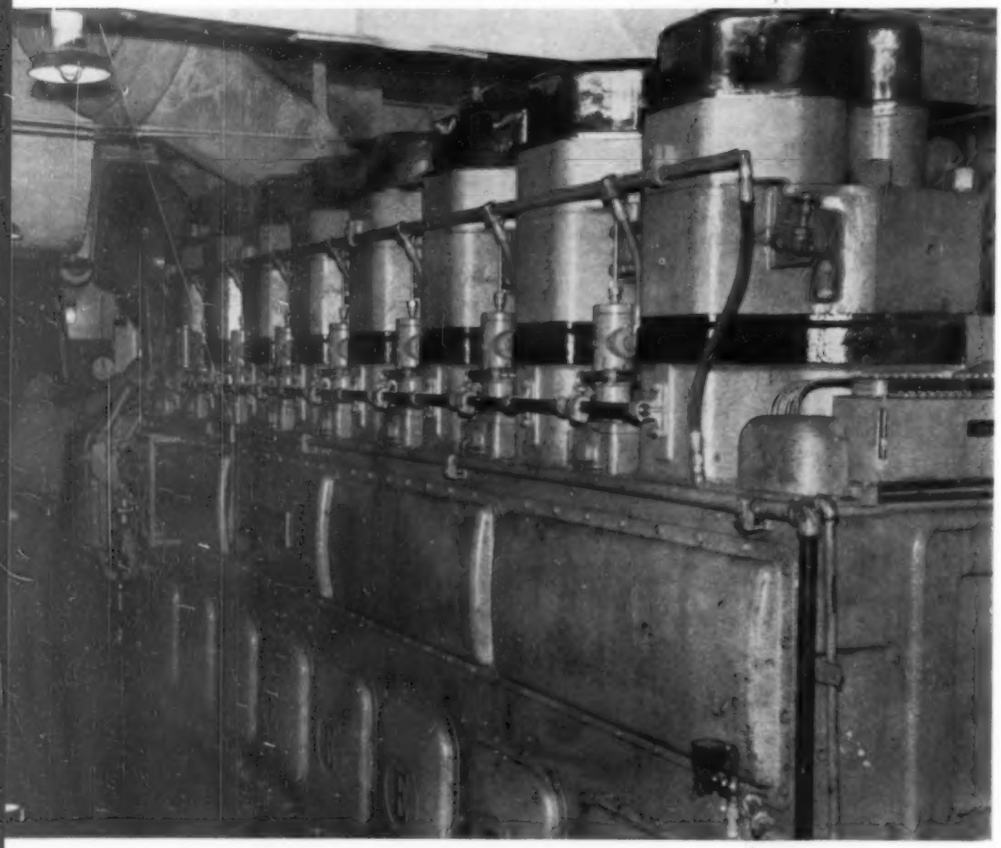
THE new coastwise containership service instituted by the Erie & St. Lawrence Corp. is a welcome development in the American maritime industry. Operating on the New York-Jacksonville-Miami run, the *M/V Floridian* and *M/V New Yorker* are another step towards eventual re-establishment of a regular East Coast, super sea-highway that flourished before World War II.

Propelled by a pair of Enterprise diesel engines totaling 4200 shp, the vessels are the first of their kind to be built from the keel up—and are among the few sea-going United States flagships which have diesel propulsion.

In 1939, at the outbreak of the war, the United States had over 2½-million deadweight tons of cargo and passenger vessels in the coastal and intracoastal maritime trade. This has since dropped to about 774,000 deadweight tons. The new Erie & St. Lawrence container type service may open a new chapter in United States coastal shipping. The speed and lower handling costs of coastal cargo containers, permits shipping companies to compete with other forms of transportation.

Both the *Floridian* and the *New Yorker* were built by the Maryland Shipbuilding & Drydock Co., and are the culmination of six years of study by the ships' owners and the George G. Sharp Co., naval architects. The vessels now in service along the eastern seaboard are patterned after the so called roll-on, roll-off type of ship. This was the type of vessel that played such an important part in WW II when loaded trucks and vehicles, ready for action, streamed down the ramps of landing craft onto our farflung embattled beachheads. The new vessels are 360 ft. long with a beam of 52 ft. and loaded draft of 14½ ft. Because of the unusual cargo hold design each vessel can carry 2100 short tons of cargo in 170 light weight sealed containers, 142 of which will be 8x8x17 ft. and 28 of them 8x8x8½ ft. In addition approximately 50 automobiles can be carried as deck cargo. These twin screw vessels have a speed of 16¾ knots loaded and 17.6 knots light. In the Erie & St. Lawrence type of operation, containers will be transferred from terminal to deck cargo space by fork lifts, a method designed to save time, labor and to avoid the use of complicated mechanisms on the ship or at the terminal.

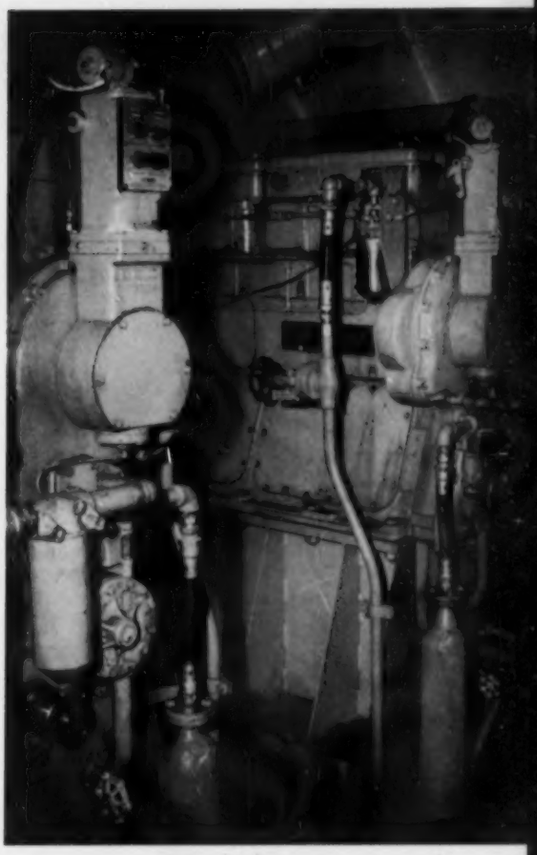
The *M/V Floridian* and *M/V New Yorker*, with their unique features, may well become milestones in naval engineering. The 360 ft. vessels have a speed of 16¾ knots. The two vessels were designed by George G. Sharp & Co., naval architects and engineers and built by Maryland Shipbulding & Drydock Co.



One of the model DMR-38 Enterprise diesel engines used for propulsion. These 17 x 21 in. diesels are rated 2100 bhp each at 290 rpm. They are direct reversing, single acting, eight cylinder four cycle marine diesel engines and are equipped with Brown-Boveri turbochargers.

Access to these sea-going warehouses is through the stern via an opening which measures 21 ft. wide and 17 ft. high. Fork lift trucks move containers from truck to ship in a matter of minutes and containers are locked into position on the ship. Lashing pads are provided on the upper deck for automobiles, boats and general cargo containers. Shore based cranes handle upper deck cargo. At the delivery port, the fork lift trucks carry the containers from the main hold onto waiting chassis for inland deliveries.

Propulsion power for both the *Floridian* and *New*



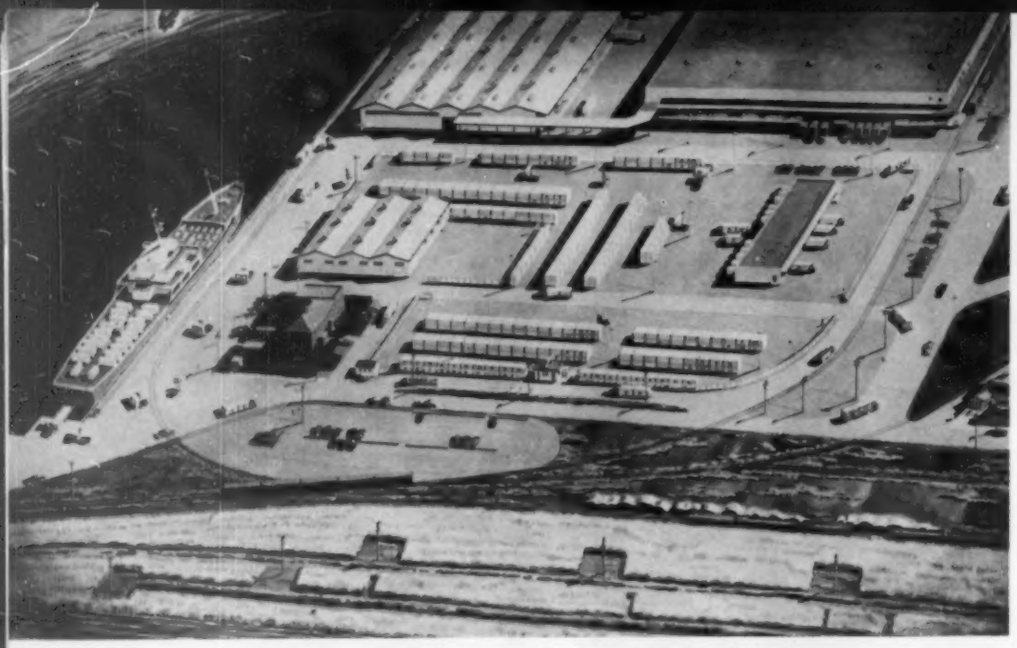
Two model DSM-38 Enterprise diesel engines supply power to the Electric Products 400 kw generators. Note Woodward governors.

Chief Engineer Stokke discusses the engine control board with the ship's oiler. Note Westinghouse Air Brake pneumatic single lever controls.

Yorker is provided by a pair of eight cylinder turbocharged model DMR-38 Enterprise diesel engines. These direct reversing, vertical, inline, single acting, four stroke diesels have a bore and stroke of 17x21 in. and are rated 2100 bhp each at 290 rpm. Horsepower of the engines is transmitted through Kingsbury thrust bearings, 109 ft. of 7½ in. propeller shafting and five split roller bearings to two 8 ft. dia. by 7.3 ft. pitch four-bladed propellers to give the ships their 16¾ knots loaded speed. They are installed with opposed rotation, and have a sliding camshaft for direct reversing. The main engines have Westinghouse Air Brake pneumatic single lever controls which are mounted in the pilot house as well as at the engine room control center.

Main electrical service is supplied by two Enterprise model DSM-38 diesel engines driving Electric Products 400 kw, 720 rpm, 440 volt synchronous generators and 7½ kw belt driven exciters. These eight-cylinder turbocharged diesels have a bore and stroke of 8x10 in., and develop 575 hp at 720 rpm. All main and electrical service engines have Brown Boveri turbochargers and are intercooled. For emergency service a GM Detroit Diesel model 3-71 drives a 40 kw Delco generator. Set is located on the upper deck. Two Gardner-Denver air compressors supply the 250 psi starting air for the Enterprise diesels.

The engines now burn Gulf #2 very fine navy type fuel oil. However they are designed so that they may burn residual heavy fuels classified as No. 4, 5 or 6 under the system adopted by ASTM. The vessels bunker at Port Newark. Fuel consumption runs about 100 bbls./day for both engines running at 275 rpm or .216 to .225 bbl. per mile for both engines. The generator diesels consume 7.5 gals./hr. each and the oil burning boiler, used for ships heating etc., burns 18 gals./hr.



Artists drawing of the Port Newark terminal of the Erie & St. Lawrence Corp.

Total ships fuel capacity is 49,037 gals. or 153.1 tons of fuel.

Lubrication for all four engines is by full pressure system. Due to the generous lubricating oil design, oil consumption is extremely low. Chief Engineer Eiran Stokke said they use Mobil DTE No. 3D in the engines oil sump as well as in the Manzel force feed lubricators. Consumption runs about 10 gals./day on each engine with the lubricators using eight gals. and the other two gals. going into the engine's lubricating systems.

The lubricating diagram runs like this: engine sump to section strainer, equipped with a magnet, to pump to filter to cooler to strainer to engine, with a by-pass line going to the Kingsbury thrust bearing and finally back to engine sump. They retain the same oil pressure in the thrust bearing as in the engine system, 65 lbs. No cooler is used in the thrust bearing end of the system.

The fuel oil system is as follows: storage tanks to purifiers to strainers to day tank to filter to a duplex strainer to the engine with the bleed going back to the day tank. The water-cooled exhaust manifold gives the engine a good safety factor. Jacket water temperature is maintained at 160 degrees.

The engine room crew consists of a chief engineer, three assistants, three oilers and one wiper.

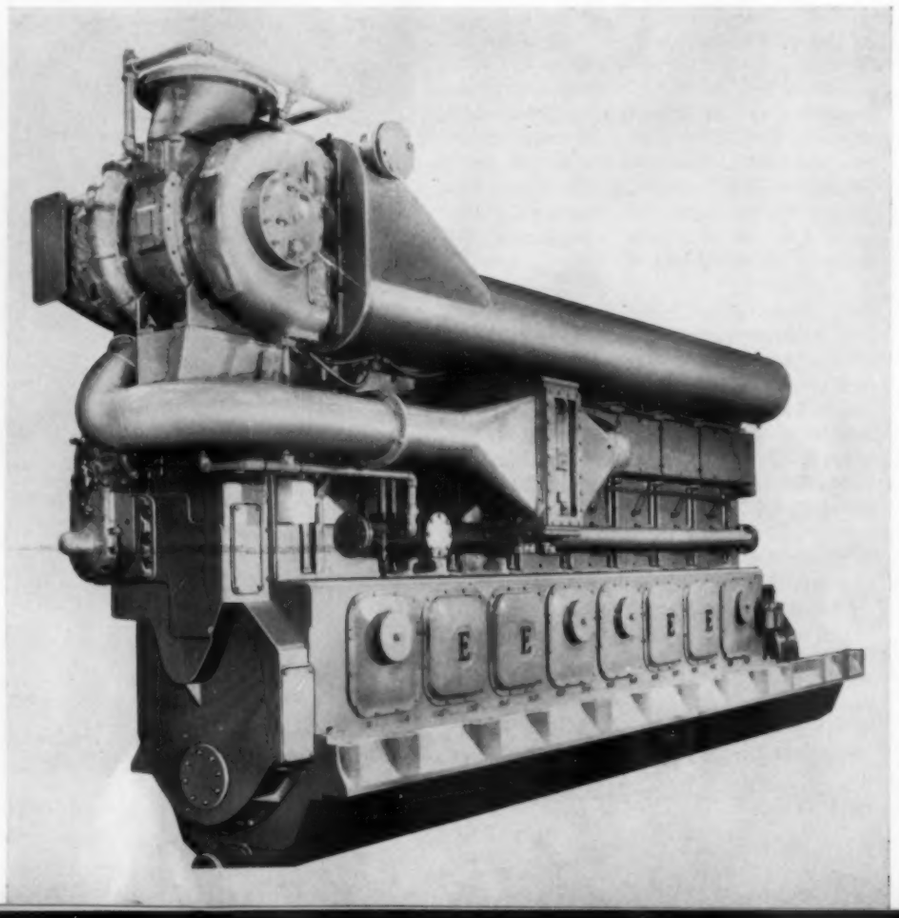
The two vessels, styled and designed to look like tropical cruise ships, are classed as coastal freighters and cost $7-million, can carry about 2000 tons of cargo in 225,000 cu. ft. of internal space and are also capable of carrying almost any ordinary general cargo. Upper deck cargoes, both container and automobiles, are loaded by shore based cranes, eliminating the need for loading gear aboard the new container ships.

Containership Service was conceived by Harry N. Moore, president of the Erie & St. Lawrence Corp., parent company of Containership. Moore spent 17 years with Dalzell Towing Co. in New York and was a director of that company before forming the Erie & St. Lawrence. Leon Zucker is secretary-treasurer and has designed a most efficient system of integrated processing for cargo dispatch. By coordinating teletype and IBM equipment, shippers can know at any time just where their shipments are located. Mr. I. W. O'Neill a former naval officer with vast maritime experience is terminal superintendent at Jacksonville. R. A. Campbell is general sales and traffic manager in New York and John T. Holt is terminal manager in the Miami, Florida area.

In its initial operations, the Erie & St. Lawrence Corp. offers twice weekly service between Port Newark and the two Florida ports with general cargo moving on the south bound trips and fruit, vegetables, paper in addition to general cargo, on the north bound trips.

Principal Equipment
M/V Floridian, M/V New Yorker

Propulsion engines (2)	Enterprise
Generator engines (2)	Enterprise
Generators and exciters	Electric Products
Turbochargers	Brown Boveri
Governors	Woodward
Injector pumps	Bendix Scintilla
Injectors	American Bosch
Exhaust silencers	Burgess-Manning
Pyrometers	Alnor
Lube oil filters	Briggs
Fuel oil filters	Nugent Purolator
Fuel oil purifiers	Sharples
Engine controls	Westinghouse Air Brake
Force feed lubricators	Manzel
Thermostatic control valve	Amot
Pressure and temperature alarms & shutdowns	Allen-Bradley
Starting air compressors	Gardner-Denver



Product view of Enterprise DMR-38 marine propulsion diesel engine. Engine is intercooled and with Brown-Boveri turbocharger develops 2100 hp at 290 rpm. Engine is a direct drive, direct reversing unit. Each of the container-ships is driven by a pair of these engines.

SMALL TURBO FOR 50-120 HP DIESELS

Model 317 turbocharger has 12 major components, shown here. Band clamp at right center allows removal of compressor-bearing housing without removing turbine housing from its engine mounting.

DESIGNED for normally aspirated engines in the 50-120 hp range, a small, lightweight turbocharger has been placed in production by Thompson Ramo Wooldridge Inc., with initial application on a new engine model of a major engine manufacturer. The new unit, designated model 317, is interesting not only in its compact and lightweight design, but also because of the low number of parts and its range of performance capabilities.

Weighing approx. 15 lbs., the model 317 is the smallest of three models produced by the TRW Turbocharger Division. It is 7.2 in. at its largest diameter and is 6.2 in. long overall. In its construction, TRW has made extensive use of aluminum in such areas as the compressor wheel and compressor housing, and in the bearing housing.

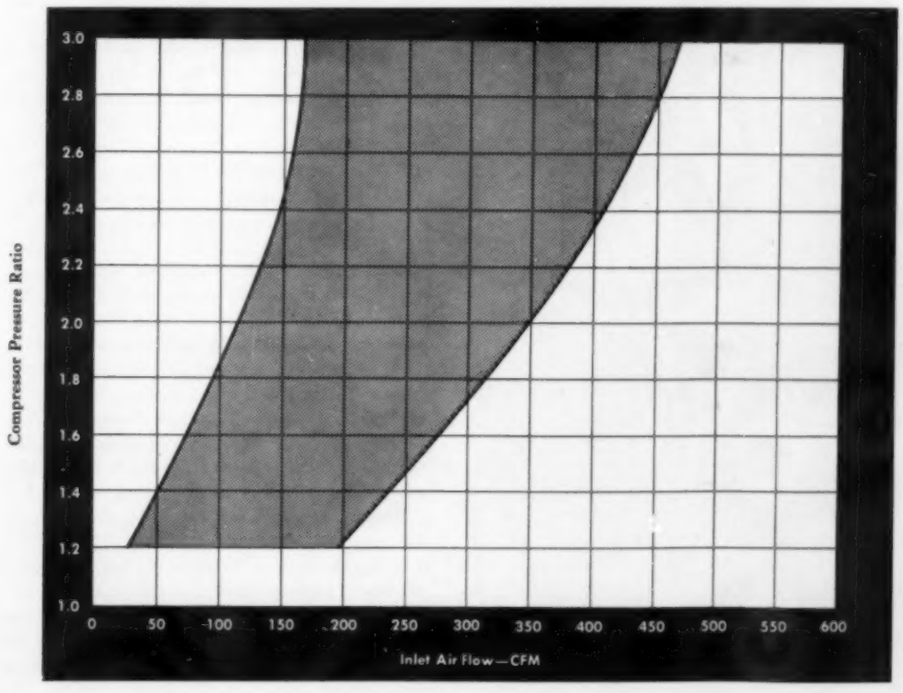
The turbocharger, field-tested for over 18 months, is capable of operating with pressure ratios of up to 3:1 and the accompanying flow chart indicates its general application range. With its small 3 in. wheel and lightness of rotating parts which results in low inertia in the rotating group, the unit has good acceleration and response qualities, indicating it is well suited to automotive type diesel application. It is designed for heavy duty service, with the efficiency capability of significantly increasing horsepower of normally aspirated diesels in the horsepower ranges mentioned. This is particularly important in many cases where the small diesel, to find most widespread application in equipment, must be compact and lightweight. Turbocharging also offers attractive advantages in doing much to establish the economic justification of using small diesels in equipment of all types.

The model 317 is of the Thompson short shaft design—a major factor in its compactness and simplicity. The turbo has only 12 major components, excluding such items as nuts and bolts, sealing rings, etc. An aluminum floating bearing of one piece design and an efficient sealing arrangement contribute significantly to the low number of parts. Further contributing to operating and maintenance advantages offered by the design simplicity is the fact that compressor or turbine wheel can be changed without requiring that the entire shaft assembly, including both wheels, also be changed. This is possible since no system balancing is required. The floating shaft bearing makes possible high rotating speeds with greater unbalance tolerance. The model 317 also has a vaneless compressor diffuser and turbine nozzle which further simplifies its design. The unit is air cooled.

The turbine housing is attached to the compressor-bearing housing by a V-band clamp over mating flanges. By loosening one nut the V-band can be removed and the compressor-bearing housings can be pulled away from the turbine housing without removing the latter from its engine mount. The same V-band clamp feature makes it possible to rotate the compressor through 360 degrees for greater flexibility in mounting.

Because of its simple design, the turbocharger is adaptable to high volume, low cost production, which allows TRW to aim at the excellent volume potential that exists in the smaller diesel engine market.

Graph showing performance range for the new turbocharger.



TRW's model 317 turbocharger for normally aspirated 50-120 hp diesel engines, which weighs approx. 15 lbs., shown in comparison to the size of an ordinary pipe. View shows the compressor side of the turbocharger.

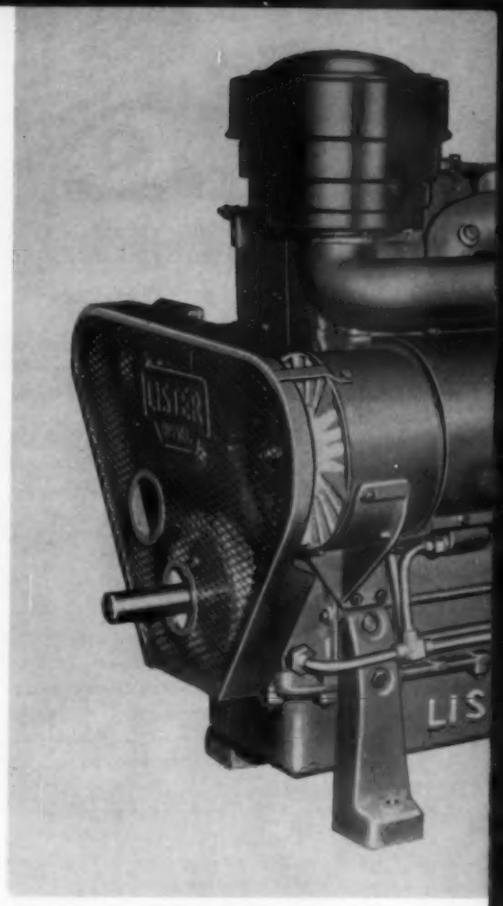
NEW AIR-COOLED MODELS ARE INTRODUCED BY LISTER

LONG past the "foot-hold" stage, small air-cooled diesels each year are moving into the field in greater numbers with a steadily increasing range of application. Compactness, longer service life, and more favorable overall cost factors are but a few of their operating advantages that appeal to contractors, aggregate producers, pleasure and work boat operators etc., requiring dependable power in lower horsepower sizes.

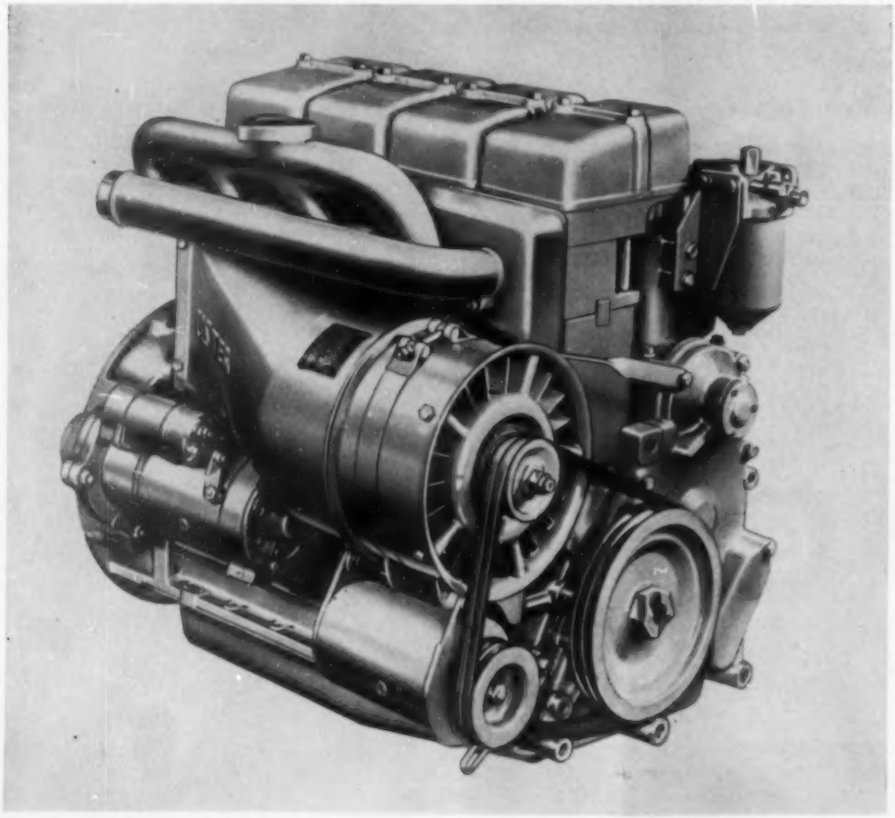
One of the air cooled diesel engine builders who has had a very active interest in the American market for a number of years is R. A. Lister & Co. Ltd., among the world's largest producers of small diesels. Sale of the engines in the U.S. is handled by Lister-Blackstone, Inc. of Long Island City, N.Y. This article covers the introduction of two new models in the Lister line. These are the SL4, developing 20 cont. hp at 2150 rpm and the HB6 rated 72 hp at 2000 rpm.

Lister has specialized in production of air-cooled diesel models in recent years. Their first model, the LD1, was introduced in this country in 1956 and gained wide acceptance by engine users in such applications as compressors, pumps and small generators. The success of this initial model led to design and production of four additional models with from one to three cylinders in a range of 3½ hp to 12.75 hp, all at 1800 rpm. The basic design of the engine was such that by modifications to take advantage of its potential to operate at higher rpm, three of the models, in a range of 5.25 to 15 hp, are now available at 2250 rpm.

The new SL4 is a four cylinder version of the original SL series engine. This is an extremely simple and compact four cycle unit which is readily adaptable to almost any application suited to its power. The engine has a bore and stroke of $3\frac{3}{16}$ in. x 3½ in. Fuel is injected directly to the combustion chamber in the crown of the low expansion, alloy piston. Pintle type injector nozzles have a single large hole and are capable of long operation without attention. Shell type main and big end bearings are used for ease of maintenance and replacement. The camshaft is carried in three bearings which are splash lubricated. Fuel feed is by gravity or lift pump to a totally enclosed C.A.V. pump and to the injectors. Overall length of the SL4 is 29½ in., width is 26 in. and height is 28 in. All working parts are interchangeable with the popular SL1/3 units. Electric starting equipment is 12 volt. The SL4 differs from the 1, 2 and 3 cylinder models in the SL line in that cooling is effected by an axial flow fan which is belt driven from the crankshaft rather than by an impeller integral with the flywheel.



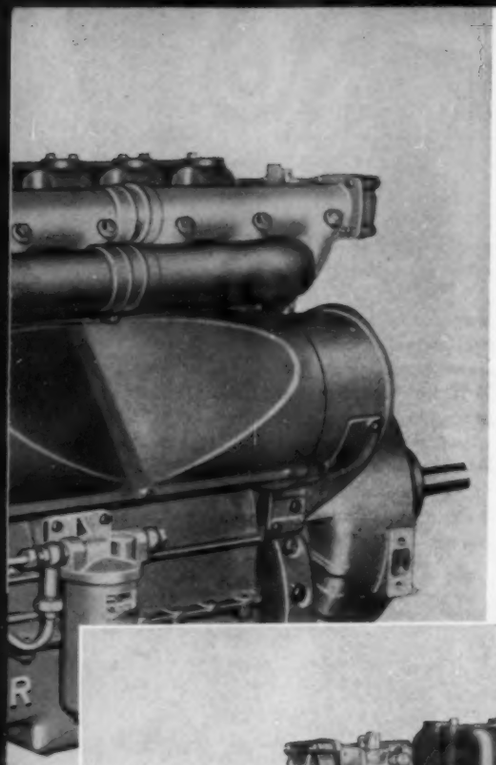
Lister model SL4 air-cooled diesel engine is rated 20 hp at 2150 rpm. This model is cooled by belt-driven axial flow fan whereas smaller engines in the SL series have fan integrally mounted on flywheel. SL4 has bore of $3\frac{3}{16}$ in., and 3½ in. stroke.



In 1958 Lister introduced the HA engine series, these developing 11 hp per cylinder at 1800 rpm. The early 1800 rpm models were available in two, three and six cylinders. Lister has now introduced the HB6, a six cylinder version of the 66 bhp HA6 (at 1800 rpm), but this engine develops 72 bhp at the higher 2000 rpm. In addition to other features, the HB6, as does the HA6, differs from the smaller HA and HB models in that the 6 cylinder engines are cooled via two single stage axial flow blowers rather than the impeller type blower integral with the flywheel of other models. The blowers are coupled in tandem and are belt driven from the engine to provide ample cooling air even with inlet temperature up to 125° F.

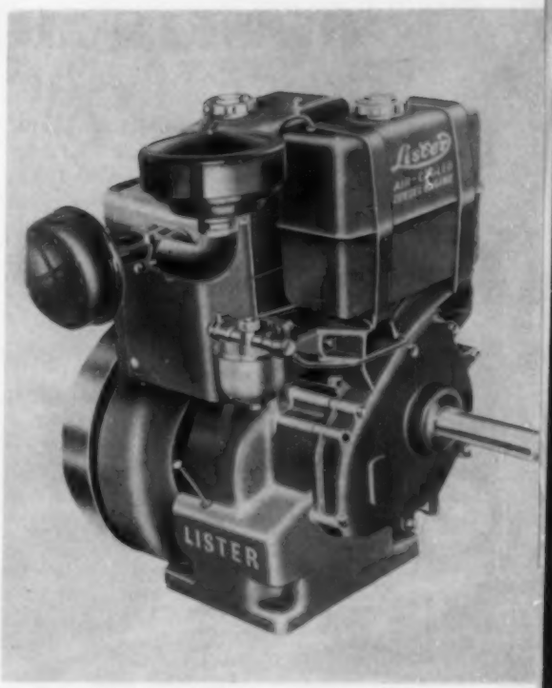
The four cycle HB6 has a bore and stroke of 4 x 4½ in. and bare engine weight is 1200 lbs. Full load fuel consumption is 0.4 lbs./hp/hr. at 2000 rpm. The fuel system of the engine comprises a lift pump delivering through a filter and a multi-element fuel pump to the injectors. Close governing is effected by a centrifugal governor driven through speed increasing gears from the fuel pump drive shaft. Provision for clutch power take-off or close coupling is available with the SAE No. 2 flywheel housing.

Lubrication is by a rotary pump which supplies oil under pressure through a full flow filter and cooler to all crankshaft and camshaft bearings, the gear train and valve rocker gear. Other parts are lubricated by splash. Lube oil consumption is

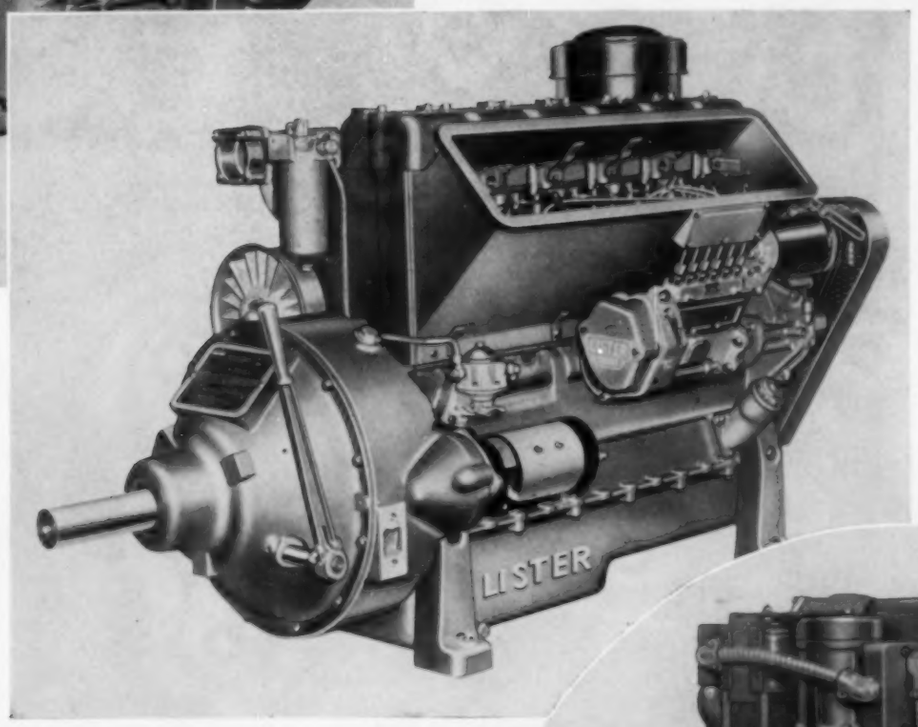


HB6 engine is rated 72 hp at 2000 rpm. This engine is air-cooled via tandem mounted axial flow fans which are belt driven from the front of the engine. Note Purolator lube oil filter.

Wroughton factory where large scale production of the LD and SL series air-cooled engines is carried out. Production capacity is over 2000 engines a week. The Cinderford unit, formerly concerned primarily with supplying parts and sub-assemblies, is now equipped for assembly of the 6/1 and 8/1 Lister lines. Another factory at Wotton-under-Edge is similarly equipped. The Lister group also has factories in Europe, Australia and South America, all built since 1946 when extensive rebuilding and modernization of their English facilities was also begun. Subsidiary and associated companies are also located in the U.S., Canada, Colombia, Mexico, Argentina, New Zealand, East Indies, Malaya, Ceylon, France and Belgium.

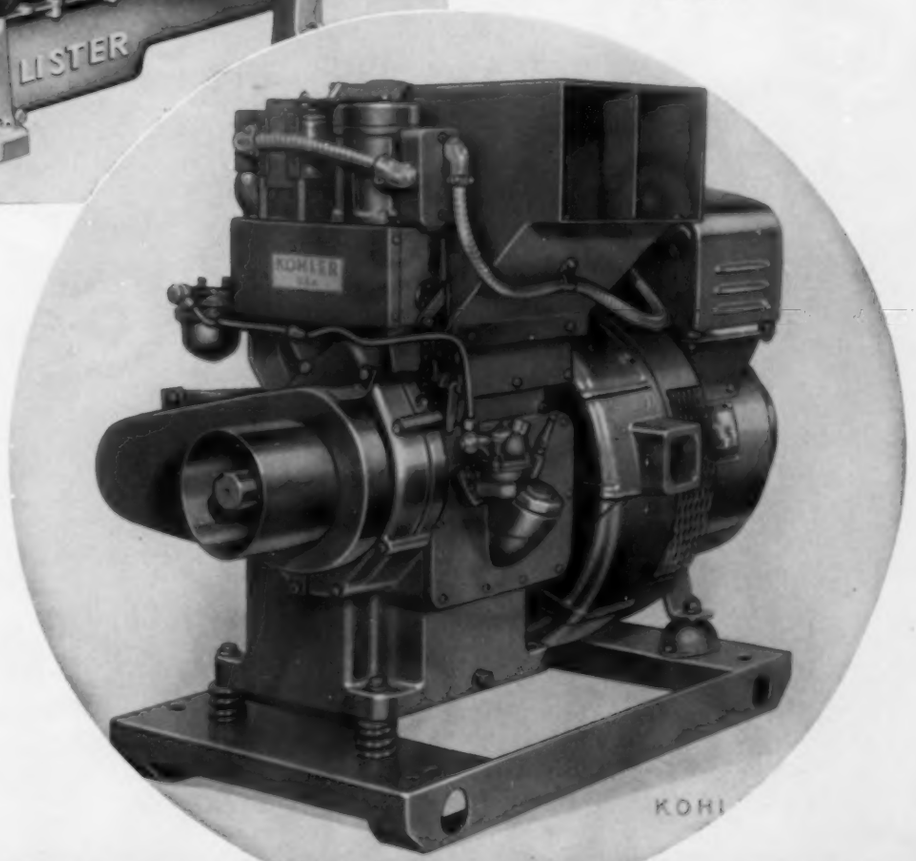


First Lister model introduced into the U.S. was the LD1 above. This is a one-cylinder engine rated 3½ hp at 1800 rpm. Faster speed version of this engine, the SL1, is rated 5¼ hp at 2250 rpm.



Fuel pump side of HB6 shows Twin Disc power takeoff available as optional equipment, cooling air exhaust duct. Note C.A.V. fuel pump. Weight of bare engine is 1200 lbs.

Lister SL2 engine is used on this 5 kw generator set produced by Kohler Co. The SL2 is 9½ hp (at 2000 rpm) unit. Generator set engine can be equipped for remote, electric or manual starting.



1½ per cent of the full load fuel consumption. Starting is by 12 volt equipment which is supplied as standard equipment. Standard flywheel rotation is counter-clockwise, looking at the flywheel. All the engines are available with a variety of power takeoff and optional accessories.

The Lister engines are manufactured in England with main offices of R. A. Lister & Co., Ltd., parent firm of the Lister group, at Durley, Gloucestershire. The firm, founded in 1867, produces, in addition to its industrial, automotive and marine diesel engine lines, electric generating sets and a wide range of farming and industrial equipment. Lister acquired the firm of Blackstone in 1936 and this division at Stamford produces primarily larger horsepower diesel engines up to 1500 bhp for industrial, marine, locomotion and similar purposes.

Small engine production is centered at Lister's

DIESELS MINE SALT BENEATH DETROIT

CHEMICALLY, salt is a simple substance. But, simple as it is, it is one of the basic building blocks for many chemical processes. There's hardly a manufacturer who doesn't use salt in one form or another: in making brass and bronze, antiknock gasoline, synthetic dyes, soaps, detergents, ceramic glazes, textiles, glass—and hundreds of other products. Rock salt is used to keep streets and driveways clear of snow and ice and, of course, when refined, salt is a basic food seasoning.

One of the nation's largest salt processors mines this common product in a very uncommon place: nearly 1200 ft. below the surface of the city of Detroit and neighboring Melvindale. And diesel equipment, with only minor modifications to cope with the salty surroundings, is playing a big part in this operation of the International Salt Co. At International's operations at Detroit, Mother Nature formed rock salt of high purity in a solid vein 26 ft. thick. It rests on a bed of shale, clay and limestone—a most convenient arrangement. But she locked the treasure 1,138 ft. under the surface and capped the rich deposit with additional layers of shale, clay and worthless rock.

To tap the massive deposit, two shafts plunge straight down into the depths. The larger shaft, sixteen ft. in diameter, handles everything going to and from the mine floor—men, materials, machinery and, of course, salt. The smaller shaft is for personnel only and here men are raised and lowered about a quarter mile in a small capsule.

The only rock salt mine in the Wolverine State, this subterranean city of solid salt was opened in 1910 by the Detroit Salt Co. International took over in 1913 and since then has completely mechanized the operation while increasing production.

International mines its Detroit holdings by the room-and-pillar system, blasting the solid rock salt bed with ammonium nitrate to form long, 50 ft. wide corridors (called rooms). Each room is separated from the next by a 50-ft. wall of salt. Breakthroughs, blasted at regular intervals along the wall, leave pillars measuring 50 x 50 ft. to support the roof. Such a system permits International to mine 60 per cent of the available mineral. This city beneath the city has several hundred miles of tunnels, 25 miles of which are used for main roadways.

Crushed salt is stored in underground caverns awaiting lifting to surface. Diesel units operate in salt-laden mine air with minimum of special equipment. Lube oil and air cleaner changes are necessary at more than normal interval because of fine salt particles in the air. Photos are from *Magic Circle*, Perfect Circle Piston Ring Co.

Gradall scaling rig clears roof of mine. Unit is powered by GM 6-110 diesel with Vortox air cleaner; hydraulic system is powered by Cummins J-6-IP engine. Note exhaust scrubber on rig platform.

International has quite a fleet of automotive equipment running through its underground city. Assigned to the job of hauling rock salt are three rear-dump, diesel-equipped Euclids, six electric, bottom-dump Euclids and one new diesel Euclid with a bottom-dump wagon. More diesel units may join the fleet since the fuel-burners can operate around the clock while the electrics must retire four or five hours each 24 to have their batteries recharged. Too, the diesels can go anywhere in the mine; the electrics must switch to battery power whenever they leave the main haulways.

In addition to five Marion shovels, the fleet in-

Completely equipped shop maintains equipment used in the salt mine. Smaller engines are repaired here; larger units sent to surface for rebuilding.

cludes one each D-8 and D-4 Caterpillar tractors, three Hough front-end loaders and eight Willys trucks. There are seven utility vehicles—Federals, Fords and a White. Specialized mine equipment, such as drill rig, loading rig, crane, universal cutter and scaling rig, is powered by engines with well-known names: International Harvester, Cummins, Waukesha, GM, Perkins and Daimler-Benz.

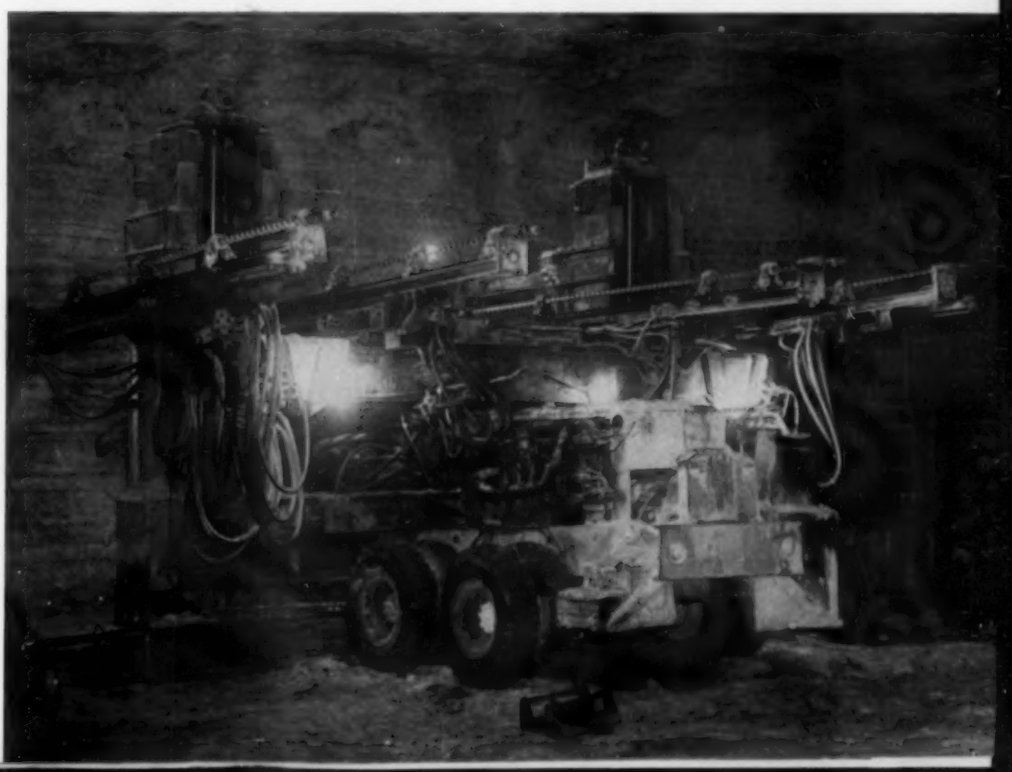
Although a huge fan blows 100,000 cu. ft. of air per minute through the mine, for added safety scrubbers are attached to diesel equipment to prevent fouling the air with carbon monoxide fumes. To get this king-size fleet onto the mine floor, it was necessary to disassemble each piece of equipment, lower it in skips to the mine and then reassemble the rolling stock 1,138 ft. below the busy Detroit streets. Skilled technicians and a well-equipped machine shop are able to handle most major repairs. Small engines are overhauled in the mine but larger engines in need of repair are sent topside for an exchange unit.

Air cleaners come in for a lot of attention here, for salt has a way of rusting exposed metal surfaces. To keep equipment in top running condition, air cleaners are serviced once a week. This precaution seems to do the job. The automotive parts distributor who handles International's engine rebuilding reports no evidence of rust or wear of cylinder walls, pistons or rings from the tiny salt particles that fill the air wherever shovels and crushers are at work.

Because of the mine's wide rooms and high ceilings, International is able to use heavy-duty equipment in its operations. Big electric Marion shovels scoop up a ton of broken rock salt in one giant bite, depositing the glittering white load in ten-ton Detroit Diesel-equipped Euclid trucks that make regular trips between the loading site and a huge underground primary crusher. As each load is dumped into the crusher, the rock salt is pounded into smaller chunks, then channelled on a rubber belt to a preparation station. Here, still deep below ground level, the salt is further crushed and screened into four commercial sizes. The processed rock salt is stored in abandoned rooms or loaded automatically into ten-ton skips for hoisting to the surface where it is again screened to insure consistent grades of salt. Under the names of Sterling Rock Salt and Sterling Halite, the product is transported to all parts of Michigan and surrounding states by rail, truck, barge and boat.

The Detroit operation is one of three rock salt mines being worked by International, which markets its products under the Sterling label. The salt that comes from under Detroit is part of a vast bed called the Salina formation, a massive layer of salt that extends across central and western New York, into Ohio, Pennsylvania and West Virginia and beneath Lake Erie into Michigan and Ontario, Canada. It covers some 70,000 sq. mi. Like salt deposits everywhere, it was formed by the evaporation of an ancient sea millions of years ago. Plant manager John L. Ryon, Jr., predicts there is still at least a 50 year supply of salt in the land to which International holds mineral rights. Producing more than five million tons of salt each year, with a total value of more than $40-million, the state of Michigan counts salt as its third most valuable mineral, outranked only by iron ore and cement.

Fletcher drilling rig is powered by Cummins model JN-6-B diesel engine, drills holes in salt face for blasting. Unit is equipped with Donaldson dry type air cleaner.



TURBOCHARGER LINE EXPANDED WITH NEW 200-1100 CFM MODEL SERIES

PRODUCTION of a new series of turbochargers which range in capacity from 200 to 1100 cfm at 2.0 pressure ratio within a single frame size was initiated recently by Schwitzer. Designated the model D series, the new production designs are based on extensive testing, not only in the company's Indianapolis laboratories, but in the test cells of engine builders and subsequently in field vehicular durability runs.

The new model series is available in the following sizes:

Model Sizes	Capacity At 2.0 Pressure Ratio
4D-354	200 to 500
4D-454	300 to 700
4D-554	400 to 900
4D-654	500 to 1000
4D-754	600 to 1100

The compressor performance coverage of each of the above models is shown on the accompanying performance chart. From the characteristics shown it can be seen that each model is capable of a broad flow coverage, not only at low pressure ratios, but also at the high pressure ratios required by present and future advanced engine designs. Many of these will make extensive use of aftercooling.

Schwitzer engineers emphasized that this wide flow range coverage is accomplished within a single frame size turbocharger. This feature is advantageous to engine builders and operators since it facilitates use of mounting parts which are common over a variety of engine models, sizes and ratings. Maintenance and servicing also is simplified since nearly all of the internal parts of the model 4D series are interchangeable.

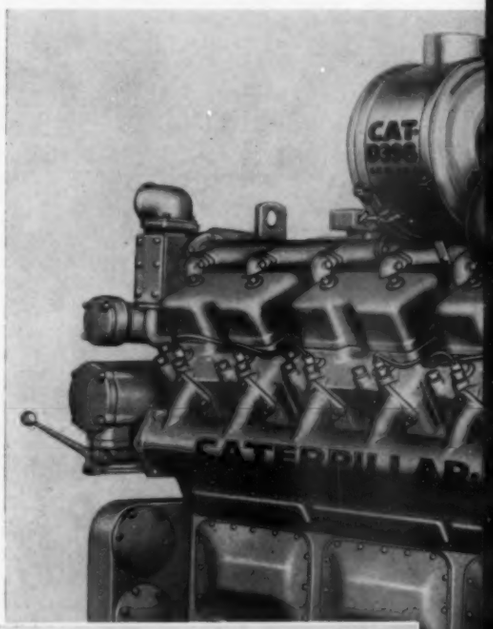
The high speed capability of the model "D" turbochargers allows sea level ratings of the engines to be maintained over a wide range of altitudes. In addition to the capabilities of the compressors, these new models also offer a number of excellent design features:

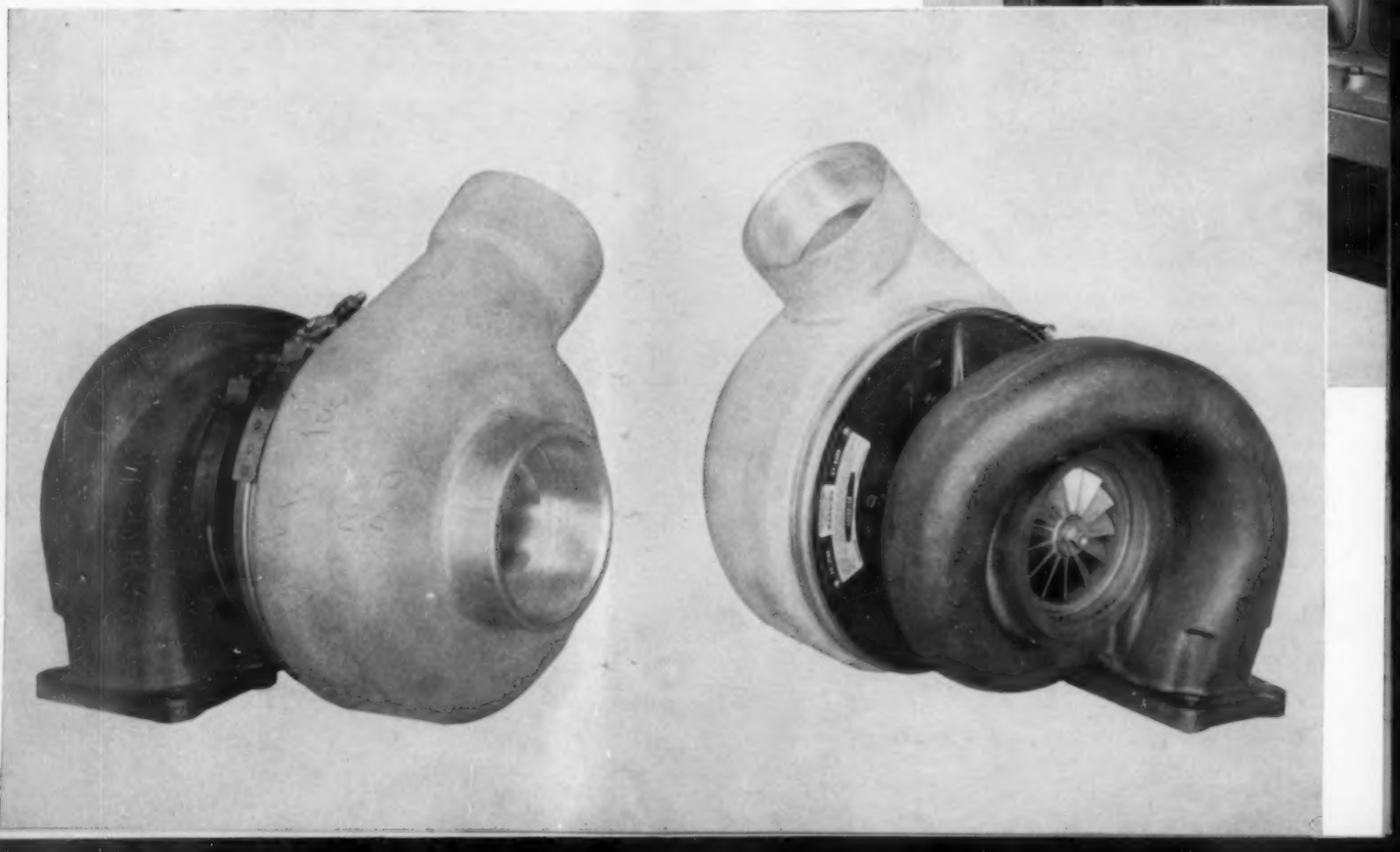
New full floating bearings assure completely stabilized operation at all speeds. This new design permits a greater, more uniform oil film on all bearing surfaces resulting in prolonged bearing life.

Oil seal. Intricate studies of the internal oil flow patterns uncovered new knowledge that led the development of an oil sealing arrangement that prevents oil leakage even under extreme inlet vacuum conditions.

Simplified construction with fewer parts, provides a rugged frame for the rotating assembly. Stresses or strains that might be caused by misalignment of connections are not transmitted through bolted or gasketed joints.

Clamp bands on both turbine and compressor housings. These increase ease of servicing and cleaning the unit, and permit universal positioning of each housing. They also allow position of the oil drain to always be in a vertical downward position. The entire core assembly or rotating assembly of the turbocharger can be removed from the engine installation without disassembling the turbine housing from the engine manifolding. This saves valuable time in changing the core assembly, or when servicing and cleaning.

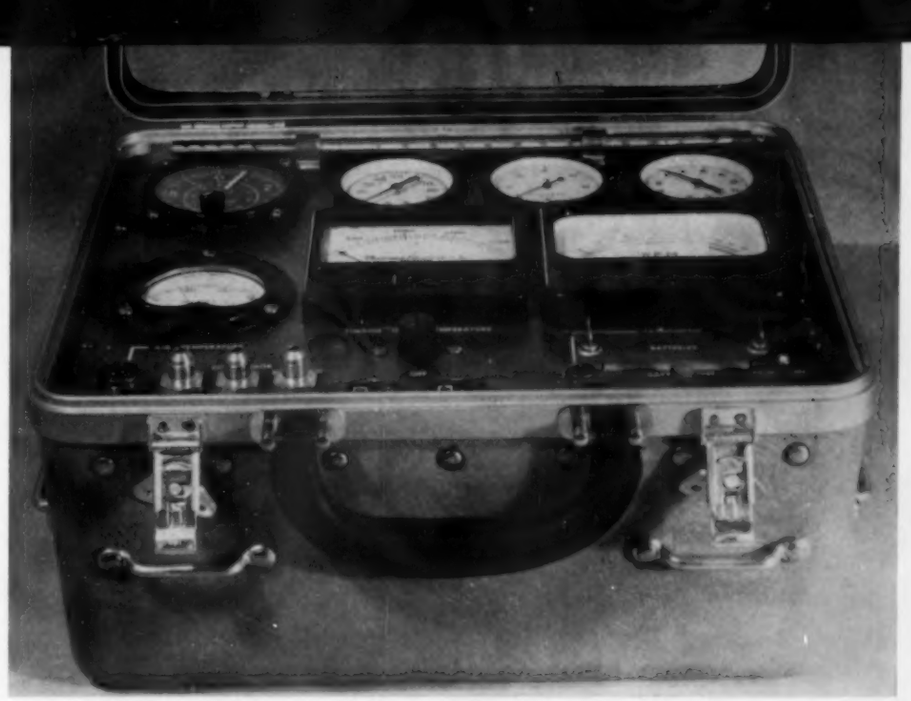




Bearing housing construction. Simplified, fully machined, internal oil passageways improve oil flow to bearings and reduce oil lag time to a minimum on engine startup. These passageways also allow adequate oil drainage when the turbocharger is temporarily at various high angles of tilt during vehicle operation.

Precision nozzle rings. Finely controlled throat openings provide closer regulation of the hot inlet gases to the turbine which contributes to achieving duplicate performance between units.

Precision cast turbine wheels. The prime considerations of minimum stress, minimum inertia and high through-flow capacity have been combined through intricate design procedures to provide a turbine wheel ideally suited to meet the stringent requisites of turbochargers applied to high speed diesel engines. The instantaneous response has been retained while the upper speed limits have been extended. Turbine wheel alloys are available to match various engine requirements.



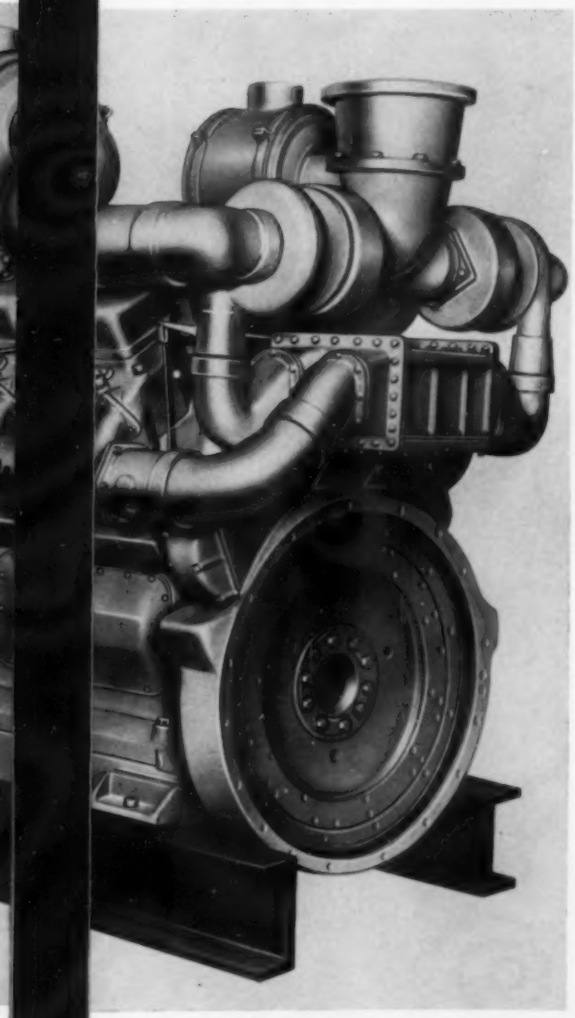
Test kit developed by Schwitzer allows service personnel to check inlet exhaust temperature, turbine speed and other factors important to efficient turbocharger operation.

Broad flow range compressor wheels. These have been designed for minimum stress and maximum vane stiffness. Greater efficiencies are achieved over the engine operating range, particularly at partial loads. These new contour wheels are precision cast from premium strength aluminum alloys to close tolerances.

Precision machined diffuser surfaces. These allow greater flow rates of air through the compressor with less friction. They also contribute to duplicate performance between units.

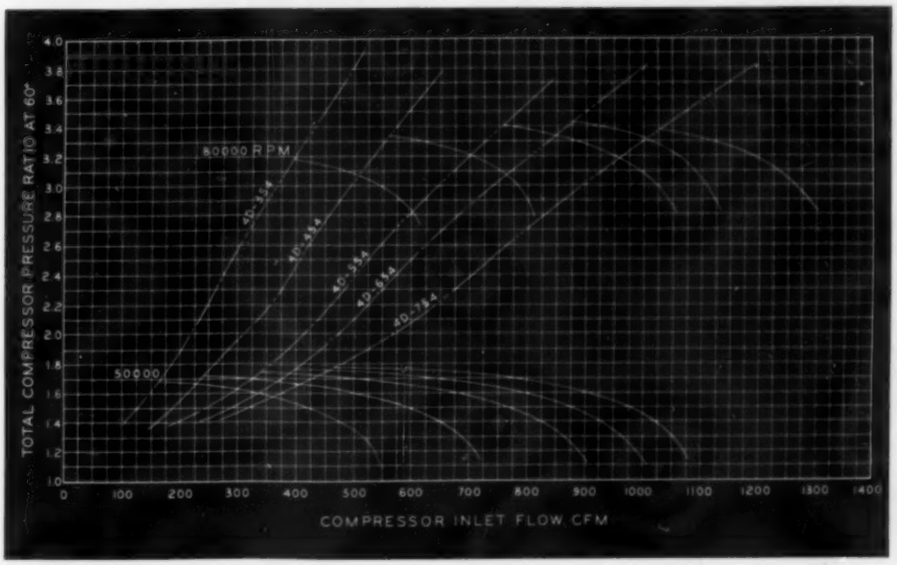
Schwitzer emphasized that these new models will augment their present line of 3 in., 4 in. and 6 in. sizes. These present models will continue to be available and can be supplied with many of the design features similar to the new 4D models.

All models can be removed from the engine, disassembled, cleaned, repaired and reinstalled quickly. Service personnel are trained to ascertain engine deficiencies that may limit the life of the turbocharger, to make necessary installation adjustments and to handle turbocharger rebuilding in the field. Special test kits have been developed by Schwitzer engineers to aid service personnel in analyzing the functioning of turbochargers installed on engines. This instrumentation accurately records important factors influencing turbo operation, including inlet exhaust temperatures, oil temperature and pressure, boost pressure and turbine speed.

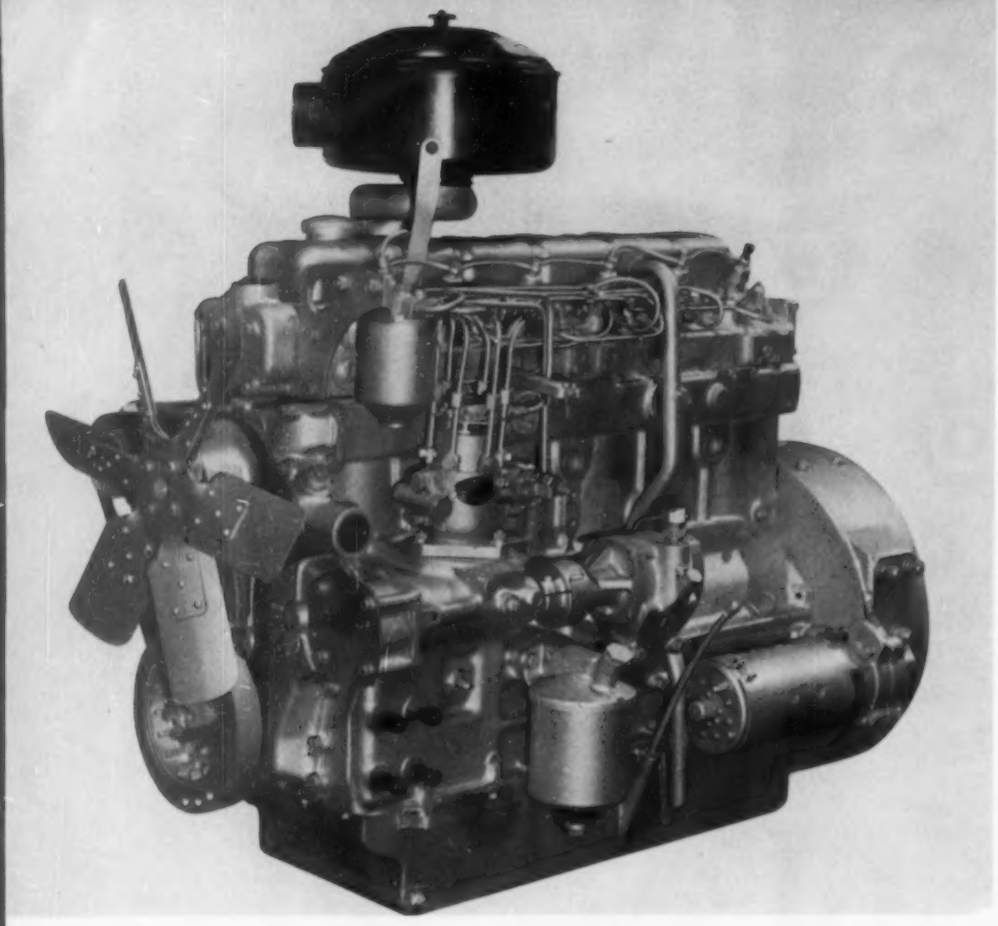


This Caterpillar D398 diesel engine utilizes two Schwitzer model 4D turbochargers. Each bank of six cylinders is cross blown. On this 950 max. hp industrial engine air from both turbochargers passes through a single split-flow intercooler before going to the cylinders.

Compressor performance of the five models in the new 4D Schwitzer turbocharger series are shown at 50,000 and 80,000 rpm turbine speed.



Schwitzer series 4D turbocharger is available in five models ranging from 200 to 1100 cfm capacity at 2.0 pressure ratio. High speed capability of the models allow sea level ratings of engine to be maintained over wider range of altitudes.



New Chrysler-Perkins 130 bhp Six 354 D engine for automotive (truck) application. Note C.A.V. fuel pump.

CHRYSLER-PERKINS 130 HP "SIX" FOR TRUCK SERVICE

By JIM BROWN

IN September, 1960 DIESEL AND GAS ENGINE PROGRESS carried the story that Chrysler Corporations' Marine and Industrial Engine Division had assumed responsibility for the sale and servicing of Perkins industrial, vehicular and marine diesel engines in this country. New to this line and an engine for which Chrysler personnel in Detroit have great hopes is the Six 354 D Chrysler-Perkins diesel engine, for light to medium duty trucks, rated 130 bhp at 2800 rpm.

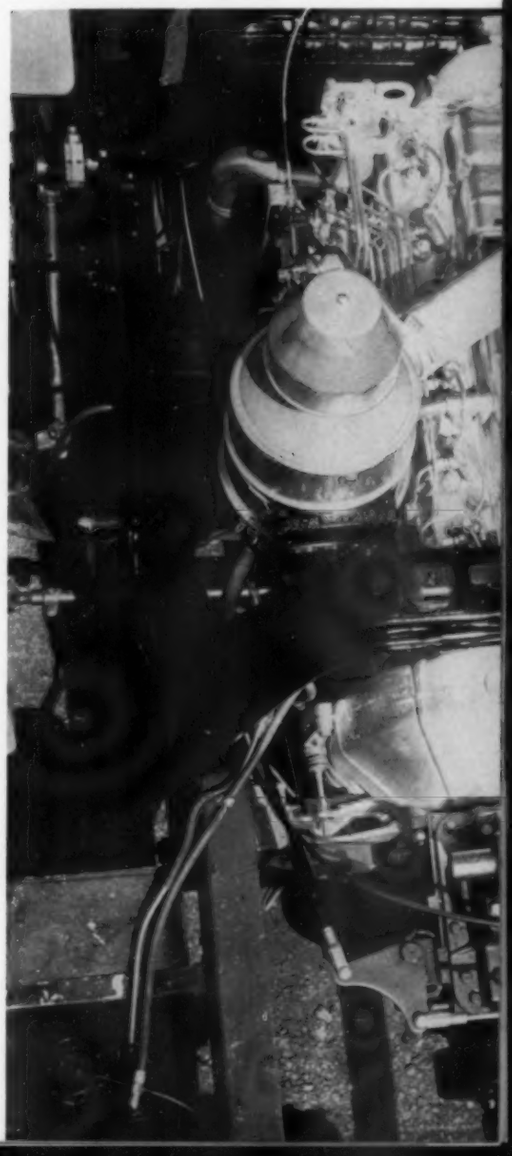
Evidence as to how well this engine fits into the chassis of a truck of only 21,000 lbs. gvw is illustrated in this article. The truck in this case, a Ford C 600 right off the assembly line, was fitted with a Six 354 D at the Chrysler-Perkins plant in Toronto, Ontario for a trucking company in Los Angeles. The usage planned for this chassis was to convert it to a van-type city delivery vehicle. No major changes were made to the Ford chassis or power train, the same gears and rear axle being used as with a gasoline engine. Upon completion of the conversion, a driver was flown to Toronto from Los Angeles to highball the bare chassis out to L. A. Fuel consumption on the trip as reported to the writer was such as to yield an average of 18.9 miles per gallon, which is excellent mileage for any truck.

The new Chrysler-Perkins Six 354 D is a six-cylinder, 354 cu. in. displacement, direct-injection 4-cycle diesel engine of 3.875 in. bore and 5 in. stroke. Proposed SAE rating is 130 bhp at 2800 rpm. Maximum torque is approximately 306 lbs. ft. at 1500 rpm. These ratings are "maximum gross power without power absorbing accessories but including water pump, fuel and lube oil pumps" at 29.92 ins. Hg barometric pressure and 60° ambient temperature.

Overall dimensions of the Six 354 D are: height, 33$\frac{41}{64}$ in.; length 35$\frac{49}{64}$ in.; width 22$\frac{31}{32}$ in. Dry weight of the engine with generator, vacuum pump (or air compressor) fan and fuel and lube oil filters is 1,020 lbs. and compression ratio is 16:1. The cylinder block of the engine is cast integrally with the crankcase with the sides of the cylinder block extending below the crankshaft center-line to form a stiffening skirt. Cylinder liners are pressed-fit, renewable, dry type liners of high quality cast iron. Water jackets are carried down the full length of the cylinders and cooling water space is provided between all cylinders.

The cylinder head is of high strength cast iron, and gasketing between head and block is of copper, steel and asbestos. The overhead valve rocker assembly is mounted on the cylinder head and enclosed by a pressed steel cover. Each valve operates in un-shouldered, cast iron guides fitted into the cylinder head. The ends of inlet valve stems are flame-hardened for wear resistance and the exhaust valve stems are stallite tipped.

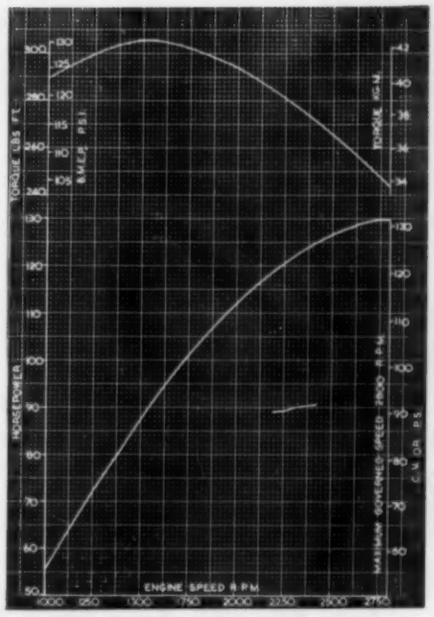
This is a direct-injection engine with fuel injected into toroidal combustion cavities machined into the piston crown. Fuel injection is by means of a C.A.V. distributor type fuel pump to individual injection nozzles mounted in cast sleeves on the left hand side of the cylinder head as viewed from the flywheel end. The fuel pump is mounted vertically on the left side of the engine and is driven by a worm gear from an auxiliary shaft. The auxiliary shaft is driven off the crankshaft, at the front end of the engine, through an idler gear in the timing gear case. On the opposite side a low-mounted camshaft is similarly driven.



"Snug As A Bug" would fittingly describe how the Six 354 D fitted into a Ford C 600 chassis. Black enamelled tank on right acts as a surge tank for water system; radiator is mounted below engine level. This is normal in this truck and was not required solely by the conversion to diesel.

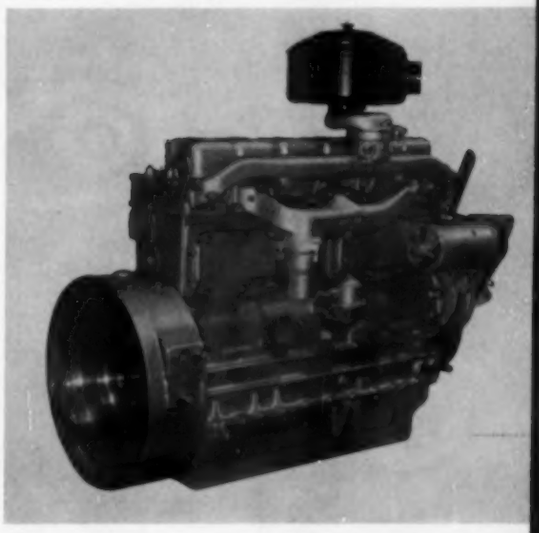
The camshaft, of high-strength cast iron with chill-hardened cams, is supported by four pressure-lubricated bearings which are machined directly into the cylinder block. Cams and tappets are splash lubricated. Valves are operated by cast-iron, mushroom type tappets with chill-hardened faces through push rods and rocker arms. Tappet adjustment is by means of a hardened ball-ended adjusting screw and locknut at the push-rod end of the rocker lever.

The crankshaft of the Six 354 D engine is forged from chrome molybdenum steel and crankshaft journals are induction hardened. Seven main bearings with thin wall, pre-finished steel-backed copper-lead replaceable bearing shells are provided. Connecting rod bearings are of the same materials. Connecting rods are of high tensile steel with the big end split at right angles to the axis of the rod. Lead-bronze steel-backed wrist pin bushings are fitted to the full-floating wrist pins which are retained in the pistons by circular clips. Pistons are of high silicon aluminum alloy and are fitted with five rings; three compression rings and one oil ring above the wrist pin and another oil ring below the wrist pin. The top compression ring is chrome plated.



Proposed SAE rating power curves of the Chrysler-Perkins Six 354 D truck engine.

Ford C 600 Cab and Chassis which was fitted with a Chrysler-Perkins Six 354 D engine at Toronto.



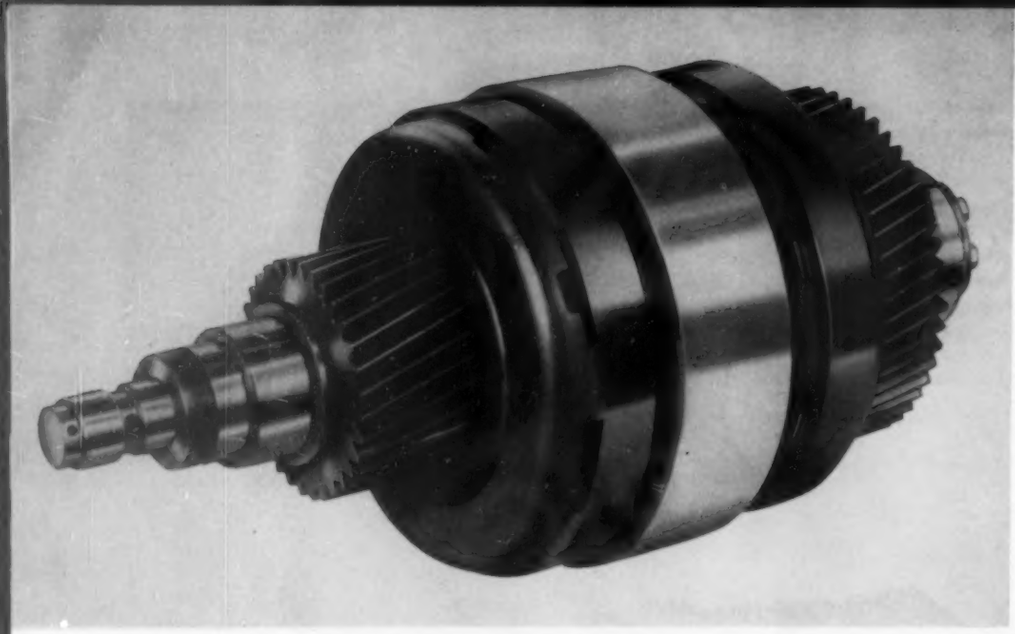
Right side view of engine shows intake and exhaust manifolding.

An eccentric rotor type oil pump, secured to the cylinder block, is driven off of an extension of the fuel oil pump worm gear. Oil delivered by the pump passes through a full-flow filter on the left hand side of the engine to a main gallery drilled lengthwise through the crankcase. The filter incorporates a by-pass delivery relief valve. Holes drilled through the main bearing housing carry the pressurized lube oil from the main gallery to the main bearings, then via holes drilled in the crankshaft, to the con rod journals. Cylinder bores and wrist pin bearings are lubricated by splash from the large bearings on the connecting rods.

A centrifugal type water pump, mounted on the front of the cylinder block is belt driven from front of the crankshaft. Alternatively, the water pump can be mounted in a high position at the front of the cylinder head. Coolant is circulated from the pump through a cored hole at the front of the cylinder block to the water rail cast in the left hand side of the block.

Twelve volt electrical equipment is used on the Six 354 D. The generator is mounted on the right hand side of the engine, and is belt driven from the front end of the crankshaft. Tension of the drive belt is adjusted by means of a slotted link. An extension of the fuel injection pump shaft serves as an auxiliary shaft to drive an air compressor or other required auxiliary equipment at engine speed. The fuel lift pump is of the diaphragm type and is equipped for hand priming. It is mounted on the cylinder block and operated by an eccentric on the engine camshaft.

W. F. Humphrey, director of sales of Chrysler's Marine and Industrial Engine Division said recently "We have high hopes for widespread acceptance of the Chrysler-Perkins Six 354 D as a truck engine in this country. It will have the backing and widespread service facilities of the Chrysler organization and should be an attractive engine for both the truck engine replacement market and new truck field."



New Power Shift hydraulic clutch by Rockford is available in six sizes to handle torque loads to 10,000 lb. ft., engines to 1000 hp.

NEW HYDRAULIC CLUTCHES FOR ENGINES TO 1000 HP

NEWLY designed engines, with their higher outputs keep component manufacturers on their mettle to develop power transmitting equipment that will put the increased engine power to work most efficiently. Transmissions must handle the increased power with a minimum of shock to drive components and they must do this job quickly and easily. Manufacturers have kept up well with the demands of the field as is typified by the Rockford Clutch Division of Borg-Warner which recently introduced a new line of power shift hydraulic clutches which are now available as components for a wide range of transmissions and machinery. The clutch design permits manufacturers to tailor their equipment to individual customer requirements.

The new line of clutches is available in six sizes to handle torque loads from 1,000 to 10,000 lb. ft., engines up to 1,000 hp and speeds up to 5,500 rpm. The dual-drive design gives end-to-end shifting with extremely smooth and fast engagements.

The clutches have been under test and development for over five years. The patented line is being designed into vehicles of some of the largest manufacturers of off-highway wheeled and track laying equipment. The versatile clutches are also expected to find application in switching locomotives, marine gears, cable and winch drives, prime movers, front end loaders, forward-reverse units and machine tools.

Extremely smooth engagements are offered through Rockford's automatic torque modulation. This modulated torque or gradual pressure build-up in the clutches gives cushioned starts under any load giving longer clutch and driveline life with finger tip operator control. The clutches transmit only enough torque to complete the shift, then continue to maximum capacity.

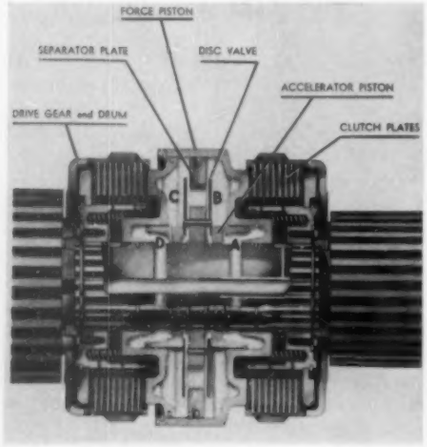
The Power Shift clutches shift and engage in less than 0.6 second. When disengaged, the clutch cavities are under constant lube oil pressure furnishing sufficient lubrication to all clutch parts. Only apply pressurization of these cavities is needed to fully engage the clutches. Oil is transferred from one clutch cavity to the other rather than being filled and exhausted. This gives ultra-fast shifting at full engine power. The clutch design provides adjustment-free operation, built-in lubrication, pressure-balanced drives, low inertia characteristics, and compact size.

The Power Shift clutch is actually two clutches on one shaft. Single-drive clutches are also available. Figure A shows the dual-drive clutch in a neutral position. The white areas show cavities which are under lube oil pressure when disengaged. The force piston can be actuated to move axially in either direction, thus compressing clutch plates of either left or right hand clutch.

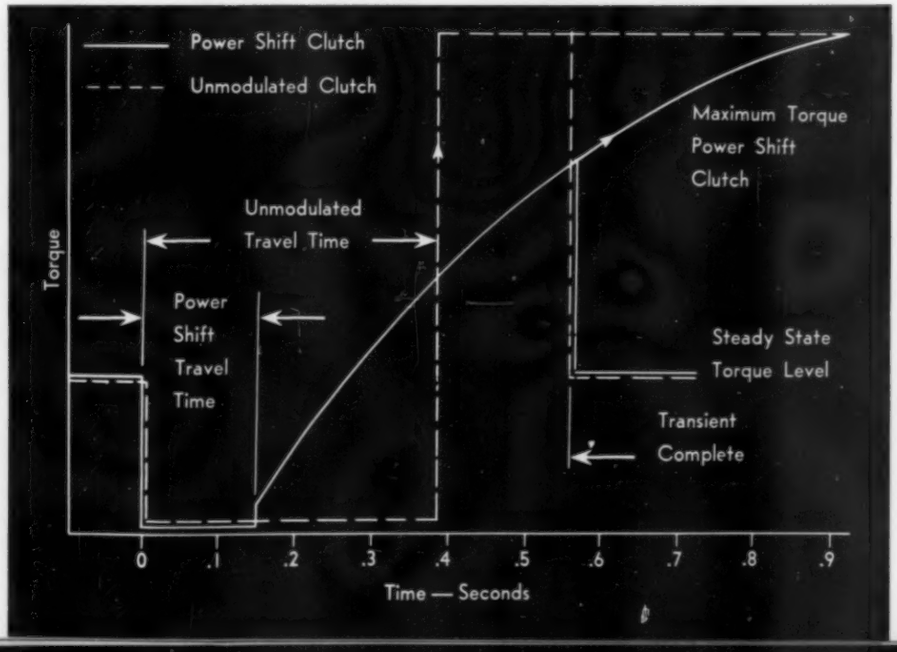
Since the clutch transfers oil from one side of the separator plate to the other, only pressurization of the piston cavities is needed to fully engage the clutch. Apply oil pressure enters the piston cavities through the center of the shaft. The left hand clutch is actuated by oil pressure through the tube in shaft while the right hand clutch is actuated by oil pressure through the open area around the tube in shaft.

Introduction of apply oil pressure into cavity "A" begins a dual movement of accelerator piston toward separator plate and force piston toward right hand clutch plates. Action of the accelerator piston and disc valves permits a unique oil transfer across the separator plate from cavity "C" to cavity "B". A gradual pressure build-up from cavity "A" to cavity "B" is accomplished by oil pressure through the small orifice in the accelerator piston. This automatic torque modulation completes full engagement of the right hand clutch.

Figure A. Cutaway drawing shows power shift clutch in neutral position.



Shorter power shift clutch travel time to initial engagement results in faster engagement and longer clutch life. Torque is gradually built up in the power shift clutch which transmits only enough torque to complete the shift, then continues to maximum capacity. This results in extremely smooth clutch operation.

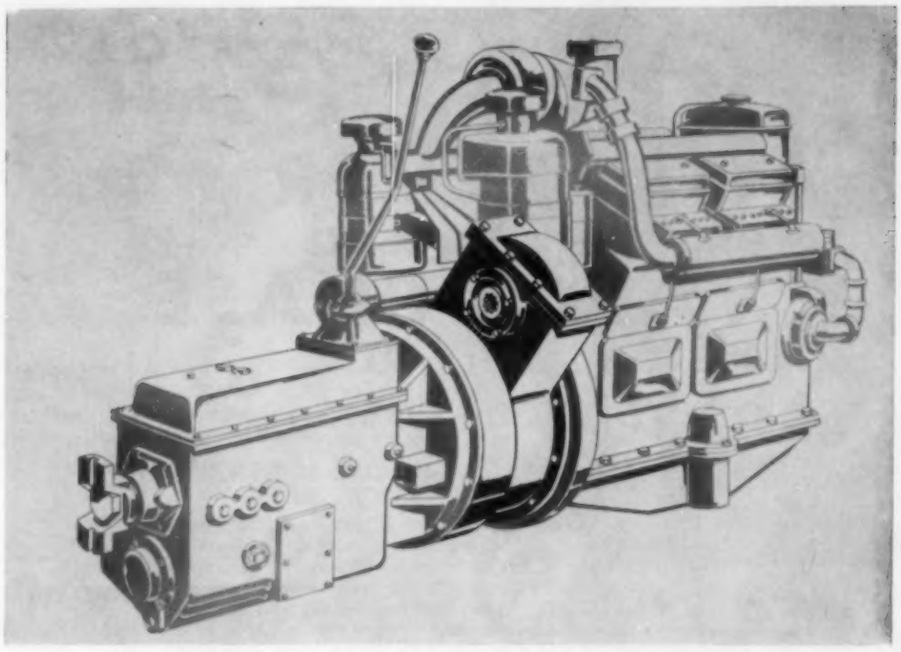


FLYWHEEL PTO RATED UP TO 200 HP

A new flywheel power take-off unit which can deliver 200 hp directly from engines rated up to 400 hp eliminates costs of auxiliary engines and "service-heavy" shafts for many pto configurations. The heavy-duty flywheel pto, designed by Cotta Transmission Co., Rockford, Ill., mounts independently between engine flywheel and master clutch. Power can be taken off even when the clutch is disengaged.

In addition to saving initial and maintenance costs of intricate power take-off designs, Cotta's "spacer" pto increases versatility of heavy construction equipment, airport utility vehicles, fire trucks, generators, auxiliary hydraulic equipment, air compressors, drills, and similar equipment. The unit adds only 12¼ in. to power train length.

Simple installation adapts this flywheel pto to any diesel engine. No alterations are required for other power train components. Standard mounting, front and rear, is provided by either SAE No. 1 or No. 2 housing. The housing, cast as one unit, endures heavy shock loads.



Cotta heavy-duty flywheel power take-off unit mounts independently between engine flywheel and master clutch. "Spacer" pto unit delivers 200 hp directly from engines up to 400 hp.

Speed ratio of standard model is 1.24:1. Rotation at 30 degree increments positions unit for specific jobs. Straight-through shaft transmits engine power to master clutch and transmission. Three helical gears deliver power from main shaft to power take-off output shaft.

11TH A.D.S. MEETING PICKS FRANKLIN

DURING the 11th regular meeting of the Association of Diesel Specialists, S. E. Franklin, Diesel Control Corp., Wilmington, Calif., was elected president of the association. He succeeds H. B. Sirotek, Illinois Auto Electric, Chicago, Ill., who completed a two year term of office. Mr. Franklin has been active as secretary since the inception of A.D.S. over five years ago. Other officers elected were: vice-president, W. J. Connell, W. J. Connell Co., Newton Upper Falls, Mass.; secretary, George H. Hull, Parks and Hull Automotive Corp., Baltimore, Md., and treasurer, V. J. D'Aversa, A & D Diesel Service, Brooklyn, N. Y.

Committee chairmen selected during the meeting were: Membership—A. C. Deans, Diesel Injection Sales & Service, Raleigh, N. C.; Service Information—M. A. Gerhardt, Gerhardt's, Inc., New Orleans, La.; Obsolete or Overstocked Material—R. E. Perry, C. A. Krohne & Sons, Inc., Springfield, Mass.; Standards—Lloyd Bailey, Diesel Injection Service, Louisville, Ky.; Public Relations—Del Anderson, Knorr-Maynard Co., Detroit, Mich.; Program—Donald E. Carncross, Woodward Governor Co., Rockford, Ill.; Exhibit—G. B. Halket, Texas Fuel Injection Service, Dallas, Tex.; Manufacturers—James N. Britton, Hartford Machine Screw Co., Hartford, Conn.

New committees announced by Mr. Franklin include: Special Assignments headed by H. E. Wittersheim, Diesel Injection Sales & Service, Norfolk, Va.; Canadian General Committee—Fred Holmes, Fred Holmes Fuel Injection Sales & Service, Ltd., Vancouver, B.C., Canada; Central and Latin American General Committee—Ing. Alfredo Christlieb, Sociedad Electro Mecanica, S.A. Mexico, D.F. 4, Mexico.

Over 100 members of the Association of Diesel Specialists and their guests were in attendance in San Antonio, Tex. for the meeting. Informally conducted service seminars proved to be a popular facet with excellent attendance, according to James N. Britton, Hartford Machine Screw Co., chairman of the Manufacturers Committee. Manufacturing members of A.D.S. who presented the seminars were: American Bosch Arma Corp., Hartford Machine Screw Co., Robert Bosch Corp., Scintilla Div., Bendix Corp., and the Woodward Governor Co. Mr. John M. Walton, Jr., John M. Walton, Inc., New Orleans, Louisiana, was chairman of the Program Committee and responsible for program planning. The next scheduled A.D.S. meeting and exhibit will be held in Minneapolis, Minn., September 14-17, 1961. A.D.S. Executive Headquarters, are at 633 East 63rd St., Kansas City 10, Mo.

Officers of the Association of Diesel Specialists, shown at the annual meeting in San Antonio with Henry B. Sirotek, center, immediate past president. From right are George H. Hull, secretary; V. J. D'Aversa, treasurer; Mr. Sirotek, S. E. Franklin, president and W. J. Connell, vice-president.

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systems can cut operational costs

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Vapor Phase cooling systems take advantage of the natural law of boiling liquids to maintain a constant temperature through the water jacket of an engine. Whereas with conventional cooling systems the cylinder wall temperature may vary as much as 40 degrees between the top and bottom—there is a difference of less than 5 degrees with Vapor Phase. By maintaining this constant high temperature, well above the dew point of exhaust gases (194°F.), condensation and the resultant acid formed are eliminated. This means less engine wear—faster warm-ups—better performance—less maintenance. Engines that normally would have required a major overhaul at 8000 hours have operated for more than 25,000 hours before being overhauled.
Another advantage to Vapor Phase is that with jacket temperature maintained at 212° F. to 250° F., depending upon the installation, engines can operate on low grade fuels such as sour gas, sewer gas and Bunker C fuel.

WASTE HEAT RECOVERED BY VAPOR PHASE SYSTEMS CAN PERFORM MANY JOBS

Vapor Phase Cooling Systems recover the Jacket Heat and much of the Exhaust Heat which is normally wasted and convert it to useful purposes. SPACE HEATING—In the Aleutians, for example the United States Air Force uses waste heat recovered by Vapor Phase to heat the living quarters of the men in the Radar Stations. No other source of heat is necessary. WATER DISTILLATION—Aboard ship and in remote areas Vapor Phase Systems supply the heat necessary to distill potable water. SLUDGE HEATING—Sewage treatment plants use waste heat recovered by Vapor Phase to heat sludge before it enters the digester, thus eliminating a boiler and the fuel needed to heat it. PETROLEUM PROCESSING—Waste heat recovered by Vapor Phase is used in the petroleum industry to heat oil for some treating processes. AIR CONDITIONING—Vapor Phase recovered waste heat can operate the water chillers for an air conditioning installation.

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The uses to which Vapor Phase Cooling and Waste Heat Recovery Systems can be applied are increasing every day. Find out more about it; write for the full story on Vapor Phase economy in your operation.

E C VAPOR PHASE

Sole developers and manufacturers of Vapor Phase Thermal Circulation (Ebullition) Engine Cooling Systems.

ENGINEERING CONTROLS, INC.
611 E. Marceau • St. Louis 11, Mo.

Nordberg Marine Department

R. D. Jacobs

Organization of a separate Marine Department in engine sales and appointment of R. D. (Dick) Jacobs as Marine Department sales manager is announced by R. W. Bayerlein, vice president Engine Division, Nordberg Mfg. Co. In his new position Jacobs will be assisted by Mr. R. P. (Pat) McBride who has been active in marine sales for some time, having previously been district manager, Engine Division in Nordberg's St. Louis office. Mr. Jacobs will report directly to C. E. Dietle, General Sales Manager, Engine Division.

DeLaval Ad, PR Director

W. F. Combs

William F. Combs has been appointed director of advertising and public relations of De Laval Steam Turbine Co., Trenton, N.J. In the newly created position, one of several major administrative organization changes at De Laval, Combs will have added responsibilities in public relations and intra-company communications as well as advertising and sales promotion, for De Laval and its subsidiaries. Frank H. Story, who has been advertising manager for De Laval, has been named sales manager of De Laval-Holroyd, Inc. Combs' previous connections include the Philadelphia National Bank, E. I. duPont de Nemours & Co., Westinghouse Electric Corporation, and Mannesmann, A. G., of West Germany. Most recently, he was executive director of the United States Inter-American Council, which is the United States section of the Inter-American Council of Commerce and Production.

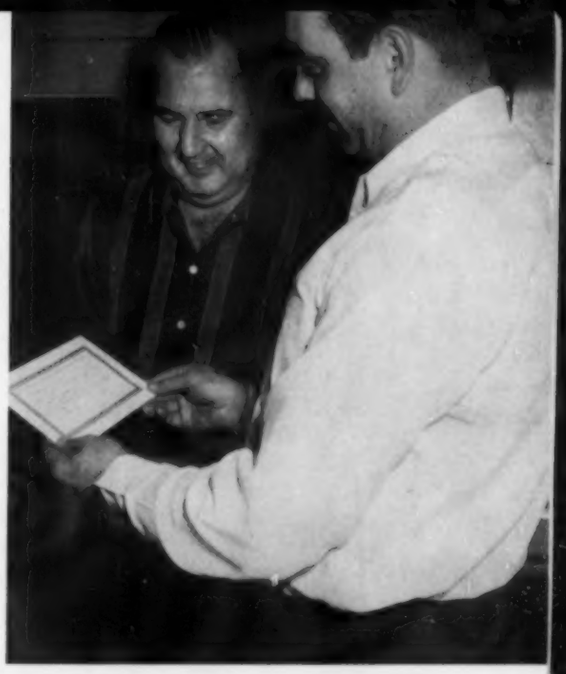
Tampa Bay Pilot Boat

In order to service incoming ships in the Tampa Bay area, the Tampa Bay Pilots Association at Pass-a-Grille Beach, Fla., had their twin screw pilot boat, *Mitzio B*, repowered with a pair of model X Ford diesel engines and Capitol 2:1 r&r gears. These four cylinder, 220 cu. in. displacement diesels develop 68 hp at 2400 rpm and were marined by Modern Power Co. of Tampa.

ENGINE TEST CERTIFICATE IS NEW SERVICE FEATURE

A NEW service now offered to diesel engine owners by distributors and dealers of the Detroit Diesel Engine Division of General Motors provides written assurance that all engine overhauls they perform conform to the standards set by the division. In addition the service certifies the results attained as indicated by dynamometer test and eliminates doubt on the part of the owner regarding the efficiency of his overhauled engine. The service involves completion of two new forms provided by the factory—an "Engine test report" and a "Dynamometer test certificate." These are processed by the distributor or dealer and delivered to the customer upon completion of the work. The test report indicates all pre-start and run-in checks made, the duration of basic run-in periods at various engine speeds and loads, adjustments required after both the basic run-in and the final inspection, and the engine characteristics as revealed by the final dynamometer test.

The "Dynamometer test certificate" is the distributor's or dealer's confirmation of the overhaul, the tests and inspections made. It is dated, identifies the engine overhauled by serial number and certifies the bhp attained.



Test certificate is presented to engine owner following overhaul and dynamometer test run. Report outlines all checks made on the engine and the result of the tests.

DYNAMOMETER TEST CERTIFICATE

_____ hereby certifies
(Name of Company)

that on _____ Diesel Engine No. _____ was given a complete
(Date)

dynamometer diagnosis and test and developed _____ HP at _____ RPM.

Your attention is drawn to the test report form in the center section of this certificate for specific comments and results. This is your assurance that this engine conforms to the standard of performance and operating characteristics as specified by the manufacturer.

APPROVED _____
Name of Company

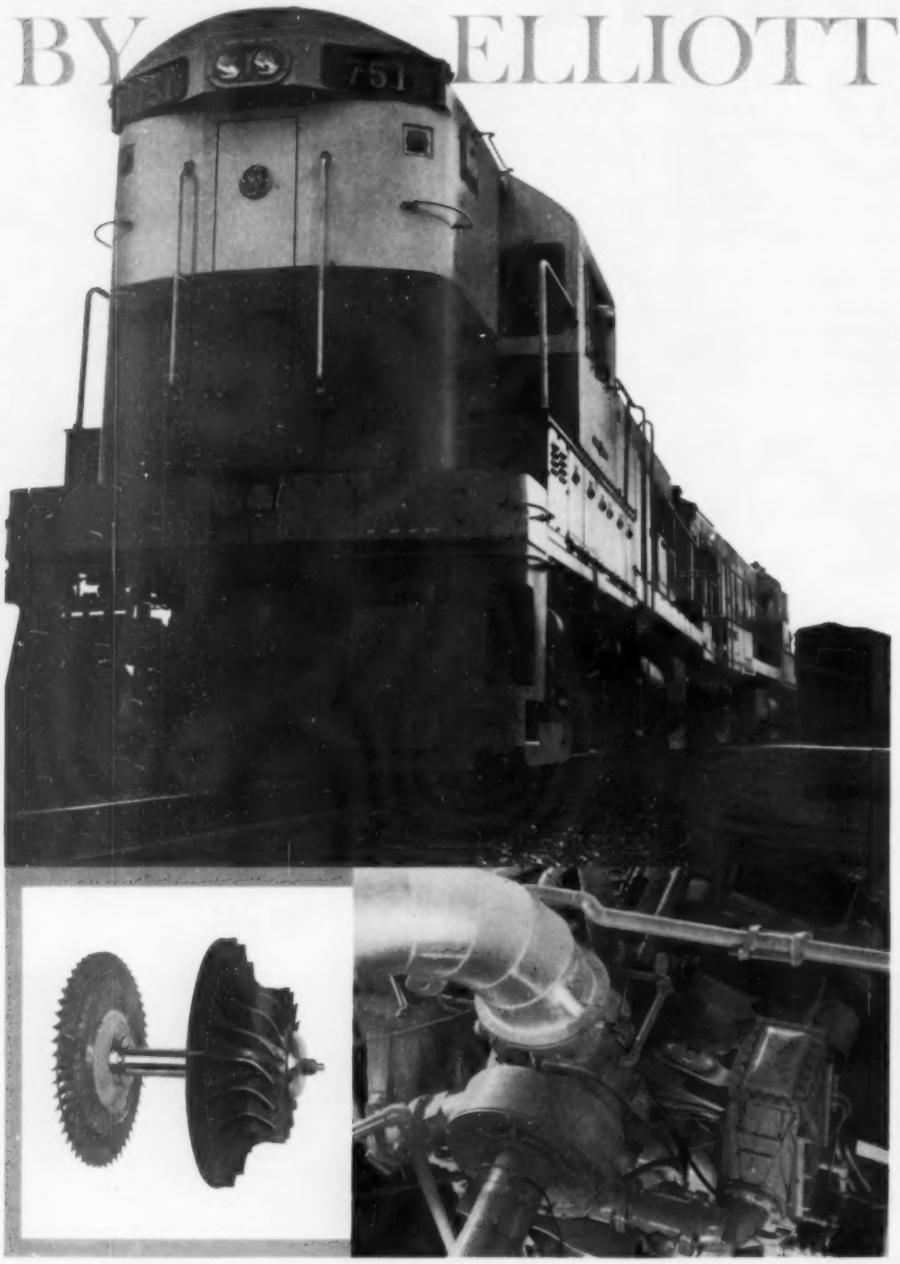
ADDRESS _____

CITY _____ STATE _____

Dynamometer test certificate is included in the report. Separate engine test sheet is also delivered to the customer and lists pre-starting, basic run-in, final run-in and final inspection data.

Mechanic makes final run-in on the dynamometer, lists top rpm under no-load and full-load, brake horsepower, oil pressure, idle speed.

TURBOCHARGED BY ELLIOTT



(Above) The heart of the turbocharger—the only moving part—is this sturdy, simple, precision-made rotor. Over 20 years of engineering and manufacturing experience has proved the soundness of Elliott turbochargers.

(Right) Elliott turbocharger on test with Cooper-Bessemer engine at the Erie Plant Engine Laboratory of General Electric Company.

A vital element of the new 2500-hp General Electric U25B diesel-electric locomotive is the high-pressure Elliott turbocharger. With a pressure ratio of 2½ to 1, it makes possible the high horsepower output of the engine. Millions of miles of experience over a period of twenty years, have demonstrated the excellent performance and reliability of Elliott turbochargers.

MO-2

ELLIOTT Company

SUPERCHARGER DEPARTMENT JEANNETTE, PA.

Marketing, Contract Executives Named

D. E. Stalter

Boeing Industrial Products Division, has announced the appointments of David E. Stalter as director of marketing and William van Amerongen as director of contract administration. Stalter has been manager of management consultant services for W. R. Grace & Company of New York. Van Amerongen has been acting director of marketing and in the past year has set up a new, broadened sales staff organized along engine application lines. Stalter has held marketing, corporate and organization planning and financial positions in both United States and Canadian machinery and chemical fields and has been active in foreign sales operations. In his new Boeing position, he will have overall direction of market research, sales planning, field sales activities, service and spares operations.

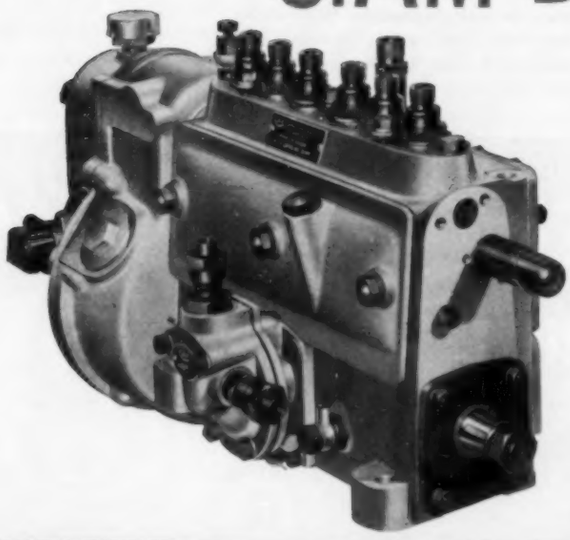
Jeep Export Models to Have Perkins Diesels

A new four cylinder diesel engine manufactured by the Perkins Group, of England, is being offered as an option in three export models of the famous 4 wheel drive *Jeep* vehicle produced by Willys Motors, Inc., of Toledo, Ohio. The Perkins Four 192 engine is available in CJ-5 and CJ-6 export models of the *Jeep* Universal and the one-ton *Jeep* pickup truck. Gross vehicle weights of the three units range from 3,750 to 6,000 lbs. The diesel engine develops 62 hp at 3,000 rpm and has a 192.4 cu. in. piston displacement. The regular *Jeep* gasoline engine has 72 hp at 4,000 rpm and a piston displacement of 134.2 cubic inches. Maximum torque in the diesel engine is 143 ft. lbs. at 1,350 rpm. While the initial cost of a *Jeep* vehicle with a diesel engine is higher, purchasers will have the diesel advantages of reduced running costs and lower maintenance charges. This is emphasized in many countries where diesel fuel is cheaper than gasoline. In other cases diesel fuel is more plentiful and easier to obtain.

Gear Lube in Spray Can

Spray Products Corp., announced addition of Spray Open Gear Loob to the firm's line. Spray Open Gear Loob in a 16 ounce pressurized can was developed to protect open and exposed gears without the use of pails, brushes, paddles or grease guns. It will lubricate hard to reach areas quickly and easily without loss of lubricant. Developed for construction, farm and industrial applications, Spray Open Gear Loob protects gears from excessive wear, rust and the elements. For use on cranes, crushers, drills, grinders, mixers, presses, shovels, winches and all machinery and equipment where an open gear lubricant is required. The firm also anounced that Spray Starting Fluid for diesel and gasoline engines is now being marketed in a newly designed white pressurized container with orange lettering.

C.A.V. DIESEL SERVICE SPECIALISTS IN U.S.A. AND CANADA



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AP 130

Bristol Siddeley Announces New Mobile Turbine Generating Set

Bristol Siddeley has announced details of a new form of generating equipment which has been designed at the Company's Power Division in Coventry, England. It is the mobile 3000 kw turbo-generator—a transportable version of the "robot pocket power stations" already in service with the South Western Electricity Board. This compact, self-contained power pack is designed to be fully adaptable to a variety of uses and employs as prime mover the Bristol Siddeley Proteus gas turbine. Little maintenance is required by this type of plant and an overhaul every ten years when used for peaking and similar intermittent duties is anticipated. The set can be on full load within two minutes of starting up; moreover, it is fully automatic and can be remotely controlled. The mobile turbo-generator pack can be mounted on a standard highway trailer or railway flat car and can be put into service at any point on road or rail system without unloading.

For permanent or semi-permanent use the construction of the pack allows installation without foundations on any reasonably level site. The air intake and exhaust systems are silenced to a noise level acceptable for residential areas. The pack can be supplied in a number of forms from a basic engine generator unit to a completely self-contained, automatic, remotely controlled set, independent of all outside equipment or supplies and requiring only fuel. Further extending the range of the generator's application, Bristol Siddeley have now designed a fuel control system permitting the use of natural gas, with no loss of performance, in areas where suitable sources are available. Typically, the set would consist of two units, one each for the generator and the control. The control pack is only required if suitable control equipment is not available at the site where the set will operate. (ITS NEW)

Air Impact Wrench

A new air-powered automotive impact wrench has been developed with an oscillating impact mechanism that makes it possible to efficiently operate such a wrench off exceptionally-low air pressures of the smallest compressors. The new wrench, the product of Thor Power Tool Co., requires such small amounts of air to strike blows that its impact mechanism can be activated by human lung-power alone. The new Thor model WA4 wrench can operate at maximum efficiency off the low 50 psi pressure of small compressors, extensive field tests have shown, yet retains its efficiency at the high pressures of 110 psi or more required by other wrenches. The wrench is designed for driving or removing nuts, bolts or screws as well as for chucked drilling, grinding, sanding, and tapping in repair shop and service operations. For more information write Thor Power Tool Co., 175 N. State St., Aurora, Ill. (ITS NEW)

Ring Bearing Catalog

A new 60-page catalog on wide inner ring ball bearings and power transmission units is available. The catalog contains complete specification charts, diagrams and photographs. Wide inner ring ball bearings are designed for users who need ball bearings which can be easily mounted on straight shafts and positioned without shoulders, locknuts or adapters. The catalog also lists the line of Fafnir power transmission units, such as pillow blocks, flange cartridges, cylindrical cartridges and take-up units. For a copy of the catalog write the Fafnir Bearing Co., 37 Booth St., New Britain, Conn. (ITS NEW)

Volvo PR, Ad Manager

John J. Collins has been named public relations and advertising manager of the Engine Division of Volvo Import, Inc. Collins was formerly eastern manager of public relations for Kiekhaefer Corp., manufacturer of Mercury outboard motors. The Engine Division distributes the Volvo-Penta marine diesels and Aquamatic inboard-outboard propulsion units in the United States from its Englewood Cliffs, N. J. headquarters. Prior to his three years with Mercury, Collins was for eight years Boating Editor and sportswriter for the Boston-Herald-Traveler. He has also been Sports Publicity Director of Boston University and Editor of the New England Yachtsman.

C-P Propeller Firm

P. K. Wennberg, formerly associated with the Marine Division of Wegner Machinery Corp. has announced the formation of a new company to be known as Propulsion Systems, Incorporated. The company, located at Manhasset, N. Y., will handle engineering, sales and service of the Liaaen controllable-pitch propeller as well as a line of rotary hydraulic steering gear units. Officers include Odd Wennberg, president and director; P. K. Wennberg, vice-president and director; Nils Liaaen, licensee and director; and Norman Basile, marine engineer and secretary. Propulsion Systems, Inc., will be represented by Avondale Shipyards, Inc., throughout the Gulf-South and Florida; by D. A. Cardina Co. of Cleveland in the Great Lakes Area, and by John H. Marvin Co. and the Foell and Massenberg Co. on the West Coast. Sales and service on the East Coast and throughout New England will be conducted by the New York office. All manufacturing, assembly and testing of the Liaaen controllable-pitch units will be handled by Avondale Shipyards in New Orleans. Avondale has been associated with the Liaaen propeller for over six years.

. . for greater ECONOMY SAFETY

AN AMAZING NEW BRAKE FOR DIESEL ENGINES

Here it is . . . a revolutionary new brake designed to meet today's demands for hauling bigger payloads at lower costs than ever before. Vehicle capacities and weight limits have steadily increased. Power sources and equipment have been improved and expanded to compensate for heavier cargoes.

Yet vehicle service brakes remained inadequate—until now!

Now the Jacobs Engine Brake gives any diesel transport complete and separate braking *independent of existing air brakes.* How does it work? The new brake converts the engine into an air pump which makes use of every ounce of braking power that a diesel engine can produce with no heat dissipation problems. This amazing Jacobs Engine Brake converts the diesel into a 100% work horse that can pull its load uphill *and hold it back going downhill.*

And the Jacobs Engine Brake can be installed on a 6-cylinder engine with vehicle down time of 4 hours or less. Simple controls are located in the vehicle cab. Any driver can employ the Jacobs Engine Brake without changing his driving habits.

The Engine Brake not only guards lives and protects loads, but it also provides important savings in these areas: increased brake lining and drum life —well over *double the life* in many cases; longer tire life; less engine maintenance; less fuel consumption; increased oil life; easier engine run-in. Savings are also gained through higher rates of downhill speed with complete safety, faster schedules, extra hours of operating time!

WRITE FOR NEW CATALOG . . . and see how the easy-to-install Jacobs Diesel Brake is already drawing the attention of fleet operators and vehicle manufacturers everywhere.

CLESSIE L. CUMMINS DIVISION
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Ring Selection Booklet

A new eight page booklet, covering selection and application of piston rings in large bore diesel and gas-burning engines, has been announced by Piston Products, Inc. Written for the man responsible for piston ring selection and replacement, it outlines suggestions for the most common problems encountered in the selection of top and intermediate compression rings, and oil control rings. Because ordinary wear and varying operating conditions dictate that new ring setups be *altered,* the booklet shows how to compensate for such factors as: poor groove condition, excessive ring wear, blow-by, tapered cylinders, out-of-round cylinders, inadequate lubrication, ineffective scraping, etc. To obtain a copy write Piston Products, Inc., 7324 Lawndale Ave., Skokie, Ill. ITS NEW

Controls Bulletin

Generator controls and Trans-O-Matic automatic transfer switches are described in a new four page general bulletin published by Lake Shore Electric Corp., Bedford, Ohio. The company's "Unified Control," combining generator control circuits, transfer switch, and optional automatic engine control panel and battery charger, is illustrated. Also illustrated is Lake Shore Electric's auxiliary controls, including the differential voltage relay and Autostatic, transistorized voltage regulator. Newer control equipment highlighted in the bulletin includes the solenoid breaker operator for remote switching applications, and the "Add-a-Block" Multistak control relay for 4 to 20-pole service. Copies of Bulletin 1260 may be obtained from Lake Shore Electric Corp., 205 Willis St., Bedford, Ohio.

ITS NEW

New Dravo Repair Yard

Dravo Corp., builders of tugs, towboats and barges, and the Greater Baton Rouge (La.,) Port Commission, have announced that Dravo will construct a marine yard on the east bank of the Mississippi River two miles south of Baton Rouge. Dravo will install facilities for major repair and maintenance of river towboats, barges and other equipment, as well as shipside service for ocean-going vessels. Future plans call for considerable expansion of this repair facility. Company executives said the repair facility is expected to be in operation in the latter half of 1961, and will eventually employ upwards of 100.

New Torque Tools

Two new Ingersoll-Rand Torque Control Impactools feature detachable torsion bars to increase the speed and accuracy of driving nuts, bolts and cap screws to a variety of precise torques. To change the torque delivered by either tool, the operator simply snaps on a different pre-set torsion bar; it's as easy as changing sockets. With the new Size 5020TD and Size 5040TD Torque Control Impactools, it is not necessary to reset the tool for each torque, nor is it necessary to use a whole array of Impactools to deliver a needed variety of torques. Each of the two new tools is available with heavy and light torsion bars. A heavy torsion bar is standard equipment with each Impactool; light torsion bars are available as optional equipment. Accessories furnished at no extra cost when specified include hose whips, vertical or horizontal hangers, torque adjusting wrenches, and maintenance tools. For further information contact Ingersoll-Rand Co., 11 Broadway, New York 4, N.Y., requesting Form 5298. ITS NEW

Static Power Guide

Hamilton Standard's Electronics Department offers a 16-page static power conversion guide which explains this new field of controlled electrical power. The booklet describes static power equipment and provides useful comparisons between static and rotating electrical devices. For free copy, write Sales Manager, Hamilton Standard, Broad Brook, Conn. ITS NEW

Diesel Conversion Brochure

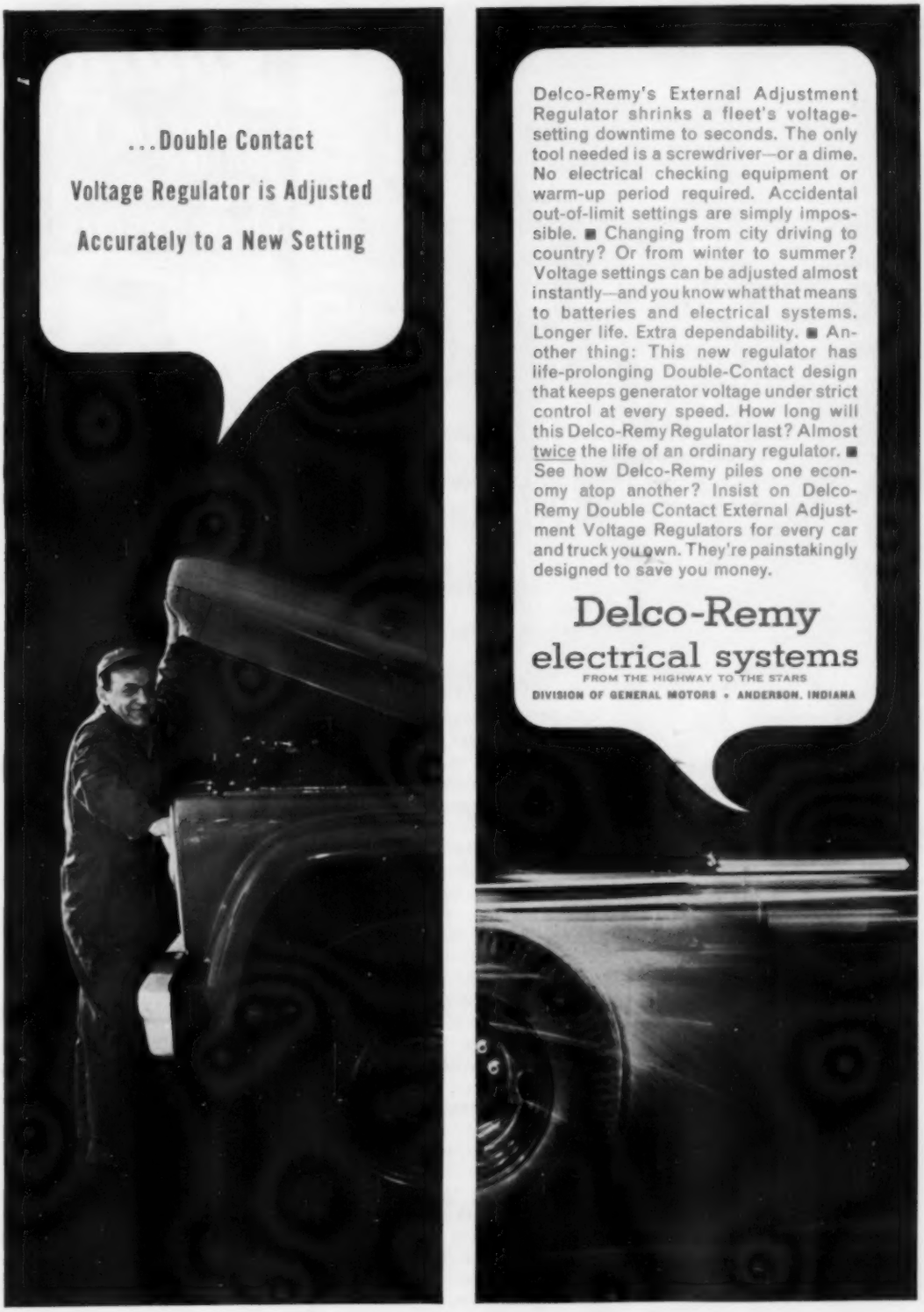
Operators of small trucks who wonder whether or not a conversion to diesel will pay off in higher profits will find the answer in a new booklet produced by the Detroit Diesel Engine Division, manufacturers of Series 53 small-truck Diesels. The booklet contains reports from operators who have already converted and a series of charts covering price, fuel and maintenance savings, yearly return on investment and other important factors. By means of these charts, any operator can figure the increased profits he can expect on his own converted operation. A copy of the booklet, *Why Diesels For Small Trucks?* can be obtained by writing the Detroit Diesel Engine Division, 13400 W. Outer Drive, Detroit 28, Mich. ITS NEW

Jungle Highway Featured

Production Road, Twin Disc Clutch Company's quarterly magazine, travels to Brazil for its feature story in the current issue. Entitled "Jungle Highway," the story deals with one of this century's most notable construction jobs—the building of the 2567 mi. Trans-Brazilian Highway. For logging men *Production Road* has an article which describes an unusual new skyline carriage called the "Skycar." This radio-controlled unit moves heavy log loads down 5,000 ft. of skyline. Copies are available on request from The Editor, *Production Road*, Twin Disc Clutch Co., Racine, Wis. ITS NEW

1960 ASTM Standards

The 1960 edition of the American Society for Testing Materials *Compilation of Standards on Petroleum Products and Lubricants* contains 168 standards of which some 31 are new, revised, or have had their status recently changed. Volume I will contain most of the ASTM standards on petroleum including crude petroleum, butadiene, motor and aviation fuels, naphthas, diesel fuels, lubricating oils, industrial oils, cutting oils, turbine oils, greases, waxes, spray oils, and other related materials. Petroleum chemists and technologists, engineers, and purchasing agents will find this compact volume handy in their daily work. This is the 37th annual edition of the Compilation which includes methods of testing, specifications, definitions, charts and tables. The volume contains 11 extensive appendices containing proposed methods. The exact size of Volume II has not been established, nor can a publication date be set, other than it is hoped that it will be available during the early months of 1961. It will include a number of standards prepared by other ASTM Committees which are related to those in Volume I and used in the petroleum industry. Copies of Volume I may be obtained from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa. at $9.50 each.


...Double Contact
Voltage Regulator is Adjusted
Accurately to a New Setting
Delco-Remy's External Adjustment Regulator shrinks a fleet's voltage-setting downtime to seconds. The only tool needed is a screwdriver—or a dime. No electrical checking equipment or warm-up period required. Accidental out-of-limit settings are simply impossible. ■ Changing from city driving to country? Or from winter to summer? Voltage settings can be adjusted almost instantly—and you know what that means to batteries and electrical systems. Longer life. Extra dependability. ■ Another thing: This new regulator has life-prolonging Double-Contact design that keeps generator voltage under strict control at every speed. How long will this Delco-Remy Regulator last? Almost twice the life of an ordinary regulator. ■ See how Delco-Remy piles one economy atop another? Insist on Delco-Remy Double Contact External Adjustment Voltage Regulators for every car and truck you own. They're painstakingly designed to save you money.
Delco-Remy
electrical systems
FROM THE HIGHWAY TO THE STARS
DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

Glen Canyon Film

Bridge to the Future, is International Harvester Company's second film salute to the building of the gigantic Glen Canyon Dam in northern Arizona. The 30-minute, 16-mm, full-color, sound production dramatically delineates the intermediate phase of work being performed under the largest single prime contract award in the history of the U. S. Department of Interior's Bureau of Reclamation—a $108-million undertaking by Merritt-Chapman & Scott Corp. Initial work, covered by Harvester's earlier "Taming a New Frontier" film, consisted of the building of the world's highest steel-arch bridge—a 1,271-foot-long structure over the Colorado River—the establishment of the community of Page, Colo., and preliminary construction of diversion tunnels.

"Bridge to the Future" produced entirely by the Harvester organization, graphically carries the story forward, from the Summer of 1958 to the Summer of 1960, when the first bucket of concrete for the dam was placed. "Bridge to the Future" can be had on loan by writing Consumer Relations Department, International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

Fiat-Bethlehem Agreement

Bethlehem Steel Company, Shipbuilding Division, and Fiat Stabilimento Grandi Motori, Marine Diesel Engine Division, Turin, Italy, have reached an agreement whereby Bethlehem ship repair yards in the United States will provide authorized maintenance services for ships equipped with Fiat diesel engines. The new agreement calls for Bethlehem shipyards to maintain bonded stores of original Fiat diesel engine parts, and is designed to provide operators of Fiat-engined ships with overhaul and repair service. Bethlehem's personnel will have the assistance of Fiat's technicians. In addition to doing this work at any of its shipyards, Bethlehem will be able to perform all necessary maintenance and repair work at pierside if the shipowner so desires.

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Michigan-Ohio News

By **Jim Brown**

DON Eckert of Earle Equipment Co., Detroit, has been appointed Asst. Sales Manager. Formerly he was employed in Earle Equipment's service department.

MICHIGAN Tractor & Machinery Co. of Detroit has installed a Caterpillar model 1673 (turbo-charged, 220 hp) in a Mack model 80 truck. The Mack will be used by Michigan Tractor to haul heavy equipment.

WOLVERINE Tractor & Equipment Co. of Detroit and Grand Rapids has delivered an International model TD-9 with hydraulic dozer blade to Charles Owens of Holland, Mich.

CUMMINS Diesel Michigan Inc. has installed a NHS-6-CI (290 hp) in a Michigan model 280 dozer. The installation was done for Miller Equipment Co. of Livonia, Mich.

TELFORD Equipment Co. of Detroit has delivered a Warner & Swasey Gradall to the Great Lakes Steel Corp. The new Gradall is powered by a GM 3-71 diesel engine and will be used to facilitate furnace repair.

CUMMINS Diesel Michigan, Inc., recently installed a new NH-250-B, 250 hp at 2100 rpm naturally aspirated Cummins diesel in a model 751 GMC tractor for Thomas Fountain of Allen Park, Mich.

J. R. Panelli Equipment Co. Inc. of Southfield, Mich. reports sale of a Case W-3 tractor-loader to Oak Park Excavating Co., Oak Park, Mich. The new loader is powered by a Case model 188 diesel (52 hp at 2100 rpm) and has a ⅔ yd. bucket capacity.

FOUR Galion model 118 motor graders powered with GM 4-71 diesel engines were recently delivered to Genessee County Rd. Commission. The sale was made by Wolverine Tractor & Equipment Co.

ANN Arbor Construction Co. of Ann Arbor, Mich. has a new GM 3055-C in their Buffalo-Springfield model K24B Roller (replacing gasoline engine). Sale and installation was by Peninsular Equipment Co. of Detroit.

CUMMINS Diesel Michigan, Inc., recently repowered a model 742 GMC truck by installing a NH-195-B 195 hp diesel for Steve A. Somodi of Dearborn, Mich. The unit is used on a steel haul.

PIERSON Contracting Co. of Saginaw has a new Caterpillar model 1673 turbocharged (220 hp) engine installed in their Mack B-80, used for hauling heavy equipment. Installation was by Michigan Tractor & Machinery Co.

CHAMPION Auto Ferry at Algonac, Mich. has accepted delivery on two GM diesel engines: a GM 6071E and a GM 6072E. The engines will be used to power an Auto Ferry. Sale was made by Peninsular Diesel Inc.

RAY Welch Inc. at Franklin, Mich. has accepted delivery on a Hough H-50 Payloader with Drott 4-in-1 bucket. The unit is powered by an International model UD282 diesel engine and will be used in excavating for sewer work. Sale was made by Wolverine Tractor & Equipment Co.

L. W. Childs, President of Cummins Diesel Michigan, Inc. appeared before the Ways and Means Committee in Washington D. C. recently, with other Cummins distributor and Cummins factory personnel to protest the proposed new tax on diesel fuel.

TELFORD Equipment Co. reports sale of an Adams 440 grader to Huron County Rd. Commission at Bad Axe, Mich. The new Adams was powered by a GM 4-71 diesel engine.

ANDY Body has been appointed as sales representative for the J. R. Panelli Equipment Co. of Southfield, Mich. He will cover Oakland County and northward to Saginaw.

PENINSULAR Diesel Inc. has installed a GM 5067-5240 diesel engine in an International 205 truck for the Holland Motor Freight Co. of Holland, Mich.

IONIA County Road Commission of Ionia, Mich. has accepted delivery on an International TD-20 to be used in general county work. Sale was made by Wolverine Tractor & Equipment Co.

PENINSULAR Diesel Inc. has converted a White 3016 truck from gasoline to diesel with a GM 5047-7240 diesel engine. The installation was done for Kramer Brothers, of Detroit.

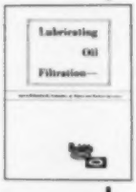
Compressor Sales Assistant

Eugene McCoy, programming analyst for The Cooper-Bessemer Corporation, Mount Vernon, Ohio, has been appointed assistant manager of gas engine compressor sales, according to D. L. Reed, department manager. Mr. McCoy came to Cooper-Bessemer in 1954 as a co-op student at the University of Cincinnati, where he received his mechanical engineering degree in 1958.

A-C Appointments

Appointment of Walter L. Peterson as assistant manager of the motor and generator department and of Robert E. Horn as acting manager of the regulator department has been announced by Allis-Chalmers Power Equipment Division. Mr. Peterson had been manager of the regulator department since 1956.

BRIGGS OFFERS YOU, FREE, AN 8 PAGE FULLY ILLUSTRATED, UP-TO-THE-MINUTE MANUAL DESCRIBING THE VARIOUS ADVANTAGES OF THE FIVE ACCEPTED SYSTEMS OF LUBRICATING OIL FILTRATION



Here is a no cost, file size, 8 page manual that gives you information that will help you plan the lubricating system of any type machine . . . from a one cylinder engine to the power plant of a battleship. Long recognized aspects related to the economics of engine and machine operation are stressed. Write today, no obligation.

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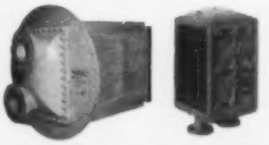

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High and low pressure intercoolers and aftercoolers are scientifically designed and laboratory tested to provide maximum heat transfer with minimum air flow restriction. Catalog No. 1652.

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YOUNG RADIATOR COMPANY
RACINE, WISCONSIN
Plants at Racine, Wis. and Mattoon, Ill.

District Sales Engineer

R. J. Graham has been promoted by Cooper-Bessemer to sales engineer in the Mount Vernon branch sales office of the East-Central sales district. Mr. Graham joined Cooper-Bessemer in 1958 as a sales engineer trainee. As Mount Vernon branch sales engineer, Mr. Graham will report directly to J. R. Craine, who is assistant manager of the East-Central sales district as well as being Mount Vernon branch manager.

Rural Generating Conference

The annual Rural Electric Generating Cooperative Conference, will be held at the Battle House Hotel in Mobile, Alabama, May 1-4. The 1961 meeting will be the 12th such meeting. Attendance of from 150 to 200 of the top supervisory and engineering personnel of cooperatively-owned steam and diesel generating plants from over the nation is anticipated. In addition, top management of many electric generating cooperative associations will attend, along with representatives of many manufacturers of equipment utilized in power plant construction and operation.

LSV Engine Brochure

A new 4-page brochure, describing the operating characteristics of the company's 12 or 16 cylinder supercharged LSV engines, has been published by The Cooper-Bessemer Corp. The engines can be provided for various fuel requirements—gas, straight diesel, dual fuel or tri-fuel. The engines are normally aspirated for 1650 to 2700 hp and supercharged for 2150 to 5450 hp. The booklet also describes the Cooper-Bessemer model ET turbocharger used on the supercharged LSV. The turbocharger is driven by the exhaust gases and is lubricated and cooled from the engine systems. The brochure, No. 77-2 also shows cutaways of the supercharged diesel engine (transverse section) and the method of pin lubrication in the articulated rod construction. It gives a full description of fuel systems and major design features. Copies can be obtained from the Cooper-Bessemer Corp., Mount Vernon, Ohio. (ITS NEW)

Fulton-Sylphon Appointments

Robertshaw-Fulton's Fulton Sylphon Division has appointed one new district sales manager and four sales engineers in the various sales territories covered by the division. John P. Balke, a veteran of 13 years in sales engineering, has been named as district sales manager for the new direct sales office of the division in St. Louis, Mo. Before joining Robertshaw, he was associated with the Powers Regulator Co. The four new sales engineers: Mack K. Jacobs, a sales engineer for the southern Texas area, who will have his office in Houston. Before joining Robertshaw he was employed by Humble Oil and Refining Co., and by Minneapolis-Honeywell; John C. Dwyer, a sales engineer in the Baltimore, Md., office of Fulton Sylphon; Thomas J. Fisher, a sales engineer in the Fulton Sylphon plant at Knoxville. Before joining Robertshaw-Fulton, he was a draftsman and applications engineer with Minneapolis-Honeywell; J. C. Cate, a junior sales engineer in the Fulton Sylphon plant at Knoxville. He was formerly employed by Texaco, Dixie Drive-It-Yourself, and the Fisher Body Division of General Motors.

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PERFECT CIRCLE PISTON RINGS ARE INSTALLED AS ORIGINAL FACTORY EQUIPMENT IN 94 BRANDS OF VEHICLES AND ENGINES. AND, MORE AWARD-WINNING FLEETS USE PC RINGS THAN THE NEXT FIVE BRANDS COMBINED
WHY THE PROS PREFER PERFECT CIRCLE PISTON RINGS...
NEW TRI-COIL OFFSET SPRING
INCREASES DRAINAGE, CUTS CLOGGING

The new stainless steel spring in Perfect Circle's OS89 heavy-duty oil ring is offset in a channel next to the drainage slots, instead of being directly behind them.

As a result, drainage is completely unobstructed by the spring, and clogging is reduced to a minimum.

And, this amazing new spring is made of 3 interwound coils. The unique design makes possible great strength and durability in a smaller diameter. There's also a greater area of contact with the ring all the way around for more uniform pressure, greater conformability and less friction.

Only Perfect Circle has this new type of ring that reduces clogging for better oil control in heavy-duty engines.

For an informative booklet on the new OS89, contact your PC supplier or write to Perfect Circle, Hagerstown, Indiana.

THE DOCTOR OF MOTORS
Skilled mechanics the world over prefer and install Perfect Circle piston rings

PERFECT CIRCLE
PISTON RINGS • POWER SERVICE PRODUCTS
HAGERSTOWN, INDIANA · DON MILLS, ONTARIO, CANADA

Tug *Connie D*

It was a case of "new muscles for an old work horse" when the Des Rocher Sand Co., Inc. of Miami, Fla., had a GM Detroit Diesel 8V-71 marine engine installed in their 37 ft. tug *Connie D*. The *Connie D* built in 1929 was repowered with a GM pilot V-8 diesel engine about two years ago. After 3200 care free hours, the pilot engine was removed and a regular production line V-8 diesel engine was installed. The new engine is rated 228 cont. hp at 1800 rpm and drives a 46x36 in. heavy duty Michigan propeller through GM 4.5:1 hydraulic r&r gears for a top speed of 8 mph at 1800 rpm. Her working speed is 4 mph with loaded barges and 6-7 mph with empty barges.

The *Connie D* hauls two sand barges (500 ton cap.) from the Cape Florida sand flats to the Des Rocher sand plant up the Miami River, a distance of 36 mi. round trip. Its fuel consumption since repowering for this type of operation is eight gallons per hour at a cost of 11.3 cents per gal.

Perfex Appointments

Two new appointments were announced by Perfex Corp., Milwaukee recently. Named to the newly created position of product manager, Petroleum Industry Division, for the heat transfer equipment manufacturing firm was H. Neil Worsham, formerly with Coynco Products and Yuba Tulsa Corp., as chief engineer. Mr. Worsham will concentrate on design and development of new products for the petroleum, chemical and petro-chemical industries. Assigned to the post of advertising

H. L. Worsham

F. C. Redfern

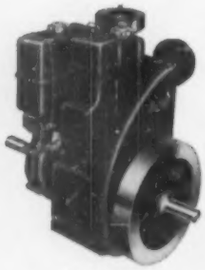
manager is F. Charles Redfern, formerly market research manager for Perfex. Before joining Perfex, Redfern was with K.C.S. Co., Milwaukee, as product research manager.

Christen *M/V J. E. Alquist*

The 6500 hp, *J. E. Alquist*, among the largest and most powerful of river towboats, was christened recently in the yard of its builder, the Jeffersonville Boat and Machine Co., Jeffersonville, Ind. It will be put into service on the lower Mississippi River, where it will be used to move large cargo barges. The *Alquist*, like its sister vessel, the *M/V Patrick Calhoun, Jr.*, will handle barge units up to one-third of a mile long and carrying as much as 40,000 tons of cargo. Propulsion power comes from four turbo-supercharged, 12-cylinder diesel engines manufactured by Alco Products, Inc. at its Auburn, N. Y. plant. The V-type engines which drive the 190x48 ft. vessel are uniquely arranged in pairs so that two engines drive each propeller shaft by means of twin-pinion, reverse-reduction gears, manufactured by the Western Gear Corp., with Wichita clutches.. The engines are Alco's model 251B. Each has a continuous rating of 1655 hp at 1000 rpm, with an overload rating of 1800 hp which affords a total of 7200 hp available for short periods when extra power is needed.

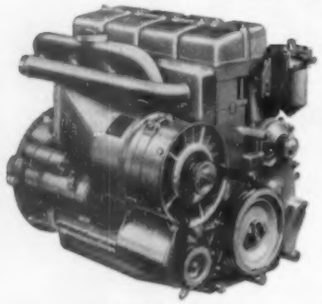
AIR-COOLED DIESEL POWER

—by Lister



Model SL1
5¼ HP @ 2250 RPM

Model SL2
10½ HP @ 2250 RPM



Model SL4
20 HP @ 2150 RPM

A COMPLETE RANGE of AIR-COOLED DIESEL ENGINES from 3½ HP to 72 HP

Engineered to suit all types of applications.

Totally enclosed working parts to insure continuous operation even under adverse conditions.

Housings and adaptors to S.A.E. specifications.

Design simplicity reduces maintenance costs.

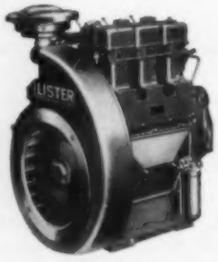
Rugged construction for heavy duties.

Economical operation with low fuel consumption.

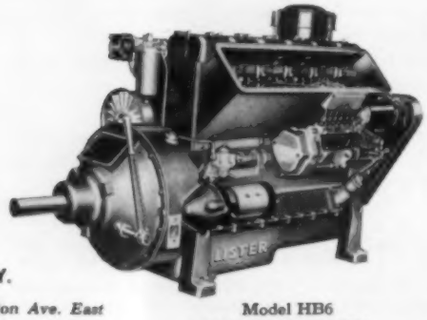
Dependable power for generating sets, pumps, compressors, etc., in oil fields, construction, marine, agriculture, mining, refrigeration, etc.

Approved by A.B.S., Lloyds and Norwegian Veritas.

Model HB2
24 HP @ 2000 RPM



Model HB3
36 HP @ 2000 RPM



Model HB6
72 HP @ 2000 RPM

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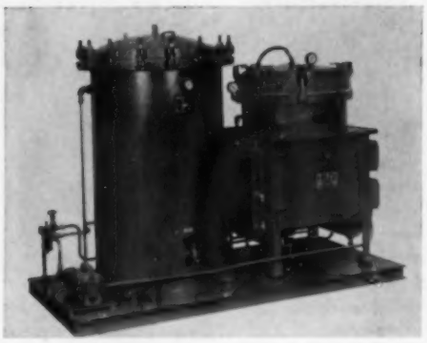
Oil Filter-Combination Reclaimer



A new oil filter-reclaimer is now in production by the Hilliard Corp., manufacturers of oil filteration machinery. The unit consists of a motor pump set of practically any capacity required for forcing the oil through the Hilco filter with either all of this oil or part of it being diverted to the Hilco oil reclaimer for final polishing and removal of moisture, water and other volatile contamination. Piping is arranged so that the oil reclaimer or filter alone can be operated where straight filteration is required or in combination, when the removal of volatile material and heavy solids contamination is necessary. Unit can be used for restoring practically all types of lubricating and industrial oils to new oil condition. Various types of filtering materials are available to handle specific types of oil. For more information request Bulletin No. 114 from The Hilliard Corp. 100 West Fourth St., Elmira, N. Y. (ITS NEW)

Safe Level Sight Feed

The Lubricator Division of McCord Corporation announced availability of the new McCord No. A 32156 safe level sight feed for use on model 55 force feed lubricators. This new device acts as a safety feature giving warning that entrained air can stop oil feeding of the lubricator. Features of the device include quick and easy priming without necessity of disconnecting the oil line, ability to be installed on any McCord model 55 lubricator feed, construction which makes it unnecessary to disturb the sight feed glass when servicing the lubricator feed and improved sealing by metal to metal contact. For successful operation of lubricators at fine feed adjustment, air must be eliminated from the oil. In the model 55 the new sight feed acts as an air filter chamber as long as the oil level can be seen in the glass. The A 32156 safe level sight feed is installed on all currently manufactured McCord model 55 force feed lubricators. This new unit can be field installed on all existing model 55 units. For more information contact John T. Davis, McCord Corp., East Grand Blvd. at Riopelle, Detroit 11, Mich. (ITS NEW)

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diesel service incorporated
2093 East 19th St., Cleveland 15, Ohio
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for all wearing surfaces where FREQUENT REPLACEMENT is required

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Clapp, Dell Assume REA Posts

Norman M. Clapp, Lancaster, Wis., has taken office as the seventh Administrator of the Rural Electrification Administration. Mr. Clapp, 46, was administrative assistant to Senator Robert M. La-Follette, Jr., from 1935 to 1937 and from 1939 until 1944. In that position, he was responsible to the senator for matters affecting rural electrification in Wisconsin. In 1944, he bought the Grant County Independent, a weekly newspaper in Lancaster, and he served as its editor and publisher until 1958. From 1953 to 1958, he also was a partner in the Muscoda Publishing Co., Muscoda, Wisconsin, publishers of another weekly, The Muscoda Progressive. While editing the Independent, Mr. Clapp won a community press award for an editorial on rural electrification. He also handled several public relations assignments for the Grant Electric Cooperative, an REA-financed electric system with headquarters at Lancaster, and participated in other co-op activities. He is a brother of Gordon Clapp, former general manager and chairman of the board of the Tennessee Valley Authority.

Richard A. Dell, veteran of 23 years experience in cooperative rural utility service, has assumed duties as deputy administrator of the REA. Mr. Dell played a major role in developing loans and cooperatives to bring electric service to farmers in the sparsely settled rural areas of the northern Great Plains. He also helped to develop REA's telephone loan program shortly after it was authorized by Congress in 1949. From March 1955 until his appointment, Mr. Dell was on the staff of the National Rural Electric Cooperative Association, an organization of REA electric borrowers, in Washington, D. C. His most recent position with NRECA was director of the Legislative and Research Department. Before joining NRECA, the new deputy administrator had spent 18 years with REA, starting in June 1937 as a power use specialist in the field.

N. M. Clapp

R. A. Dell

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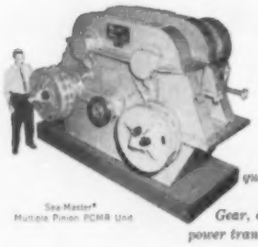
And here is what quality means in gear drives!



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W **WORTH**...*so good, our designs have become a standard of comparison in industry.*

E **EXPERIENCE**...*more than 70 years of service to industry, thousands of engine-driven gear installations.*

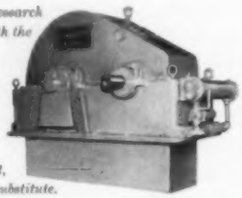
S **SUPERIORITY**...*proven designs... advanced manufacturing techniques... rigid, uncompromising quality control methods.*

T **TRUST**...*the integrity of Western Gear, one of the world's major designers and manufacturers of mechanical power transmission equipment.*

E **EFFICIENCY**...*precision manufacture guarantees lowest transmission losses. Actual figures proved by factory tests.*

R **RESEARCH**...*advanced research programs in materials and manufacturing technology are combined with the finest employee craftsmanship.*

N **NAME**...*Western Gear—symbol of Western Growth and leadership in the power transmission field for more than 70 years.*



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Don't settle for something "just as good". Imitations are not the equal of genuine Sea-Master, Pump-Master or SpeedMaster gear drives designed and manufactured by Western Gear Corporation. Sea-Master catalog 5905, SpeedMaster catalog 5802, or the new Pump-Master catalog 6112 is available on request. For full information write Western Gear Corporation, Industrial Products Division, P.O. Box 126, Belmont, California. Telephone LYtel 3-7611.

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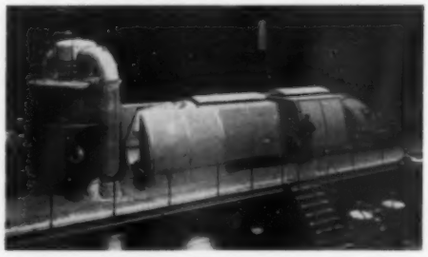
432 HP 12V-71 Powers New Euclid Six-wheel Scraper

Euclid Division of General Motors has announced its largest scraper—the new Model SS-40 six-wheeler. Payload capacity is 125,000 lbs.; struck capacity is 40 cu. yds., with an SAE rating (heaped at 1:1 slope) of 52 yds. The SS-40 is powered by a GM 12 cylinder diesel engine (12V-71) of 432 hp. It is equipped with an Allison Torqmatic drive having four forward and two reverse speed ranges that provide full power shift. The tractor of the SS-40 can be quickly attached to a Euclid bottom dump with 40 yds. struck capacity. Specifications for the SS-40 scraper are available from Euclid Division of General Motors, Hudson, Ohio.

ITS NEW

10,000 KW Gas Turbine Plant

Sulzer Brothers, of Winterthur, Switzerland, have built a 10,000 kw gas turbine plant to be installed in Saudi Arabia for Aramco. The photo shows the plant on the test bed of the firm. A model was part of the Sulzer exhibit at the ASME Gas Turbine Conference and Exhibit at Washington. Also included in the exhibit was a view of a 3,000 kw monobloc gas turbine plant.



Continuous-Duty Battery Charger

A continuous-duty battery charger adjustable from 50 milliamps to 2 amperes output at 6, 12, 24, or 32-volts is announced. Designed primarily for use with stationary diesel standby equipment, the charger enables batteries to be maintained at safe operating levels during standby periods. The unit is available with an optional relay control to cut out the charger when the engine is started. A tapped input transformer permits the charger to be used with any convenient power source. Charging rate is adjustable by means of a rheostat control. The charger also is available with a "high-low" charging rate as optional. It is designed for either surface of panel mounting, and is housed in a heavy-steel cabinet 4¼ in. wide, 7 in. high, by 3½ in. deep. Standard NEMA enclosures also are available for the charger. Further information may be obtained from Lake Shore Electric Corp., 205 Willis St., Bedford, Ohio. (ITS NEW)

Power Units in Production

View of the Stewart & Stevenson Services Maplewood assembly plant represents portion of production amounting to 933 types of power application. In the photo self-propelled diesel engine-driven generator sets for airport utility service are in the production line. General Motors model 4-71 modified E power units are also being assembled with 400-cycle ac generators and power transmissions for airport utility units, model 2-71 GM engines and generator units, are being prepared for reefer car service on the Santa Fe Railroad.

WANTED TO BUY

Old or new stationary diesel, dual fuel or gas engines, with or without generators.

FOR SALE

New and used diesel, dual fuel or gas engines, parts, cylinders, heads, pistons, pins, rings, bearings and crankshafts etc.

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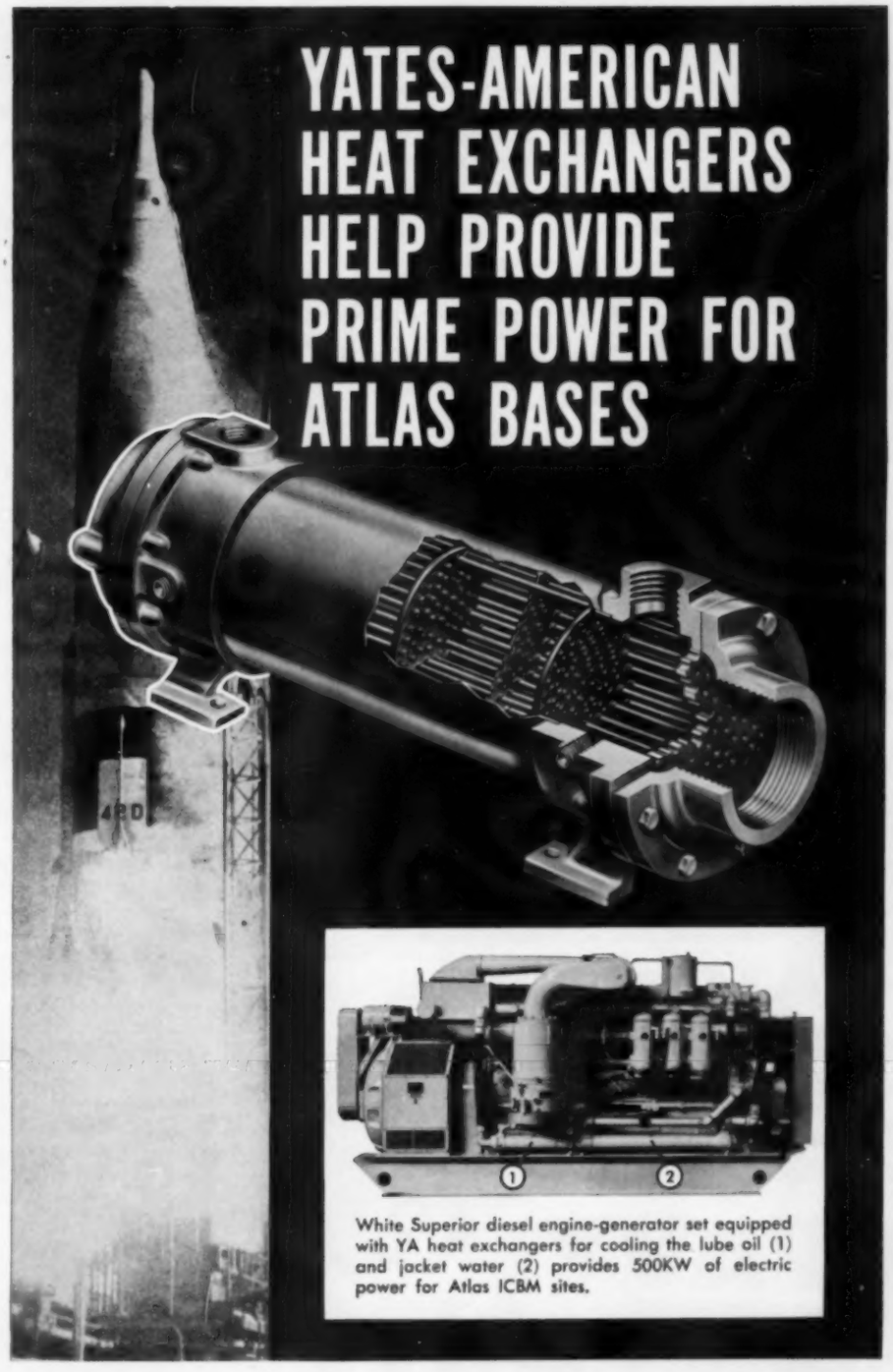
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White Superior diesel engine-generator set equipped with YA heat exchangers for cooling the lube oil (1) and jacket water (2) provides 500KW of electric power for Atlas ICBM sites.

High quality and dependable performance of YA Heat Exchangers is symbolized by their selection for cooling the lube oil and jacket water on the White Superior Diesel 500KW engine-generator units which provide the prime power for operation of the "hardened" underground bases for the Atlas ICBM. Heat exchangers of the fixed bundle type are available in sizes to 8" diameters . . . removable bundle units in sizes to 31" diameters.

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Purchase Agency Directory

The third edition of a directory of military agencies responsible for development of missile ground support equipment has been compiled by the Department of Defense and is for sale to the public by the Office of Technical Services, Business and Defense Services Administration, U.S. Department of Commerce. The directory, divided into Army, Navy, and Air Force sections, lists various components, such as "axles and differentials," "bearings-ball and roller," and "bodies-truck and trailer," then lists the agency and the name of the individual within the agency who has cognizance over the item. The directory is identified by OTS as PB 161535 (Rev. 1) and is titled *Technical Resources Directory-Missile Ground Support Equipment No. 3*. It was compiled by the Office of the Director of Defense Research and Engineering, contains 25 pages, and sells for 75 cents. Orders should be addressed to OTS, U. S. Department of Commerce, Washington 25, D. C.

Assistant Sales Manager

John W. Chandler has been appointed assistant manager, diesel sales, for the Beloit Division, Fairbanks, Morse & Co. Mr. Chandler formerly served in the company's executive offices in Chicago as assistant for sales planning to the vice president, marketing. Before that he was manager of the district office at St. Paul, Minn., serving eight north-central states.

Gas Turbine Ship Completes World Trip

The gas turbine ship, *William Patterson*, the first free-piston powered merchant ship to sail under the United States flag, has completed a 6-month circumnavigation of the world. The *Patterson*, a Liberty Ship built in 1942, was repowered in 1957 with six free-piston gasifiers built by the Cleveland Diesel Engine Division of General Motors in cooperation with General Motors Research Laboratories, under the Maritime Administration's Ship Modernization Program. The *Patterson* is rated at 6000 shaft horsepower. The ship has sailed 65,000 mi. or roughly the equivalent of three trips around the world, with an average fuel consumption of .540 pounds, including auxiliaries, per shaft horsepower. The vessel has made 92 ports of call and has been fueled with Bunker C oil in many world ports. The *Patterson* is operated by Lykes Bros. Steamship Co., Inc. Since the ship was repowered and went into service in 1957, she has traveled a distance of more than 170,000 mi. From September 1957 to early 1960 she was in service in the Atlantic and Meditrranean. In early 1960 the ship was berthed at the Bethlehem Steel Company, Shipbuilding Division, Baltimore Yard, Baltimore, Maryland for study and modification of the propulsion machinery. As a result of these studies, the vessel was returned to service in August 1960.

Perkins Order

Orders totalling more than $3,000,000 have been placed by a German combine harvester manufacturer with Perkins Engines Ltd., of Peterborough, England. They have been received from Gebr Claas Maschinenfabrik, of Harsewinkel, West Germany, and include a substantial order for the new six cylinder, direct injection Perkins Six 354 agricultural diesel engine. This engine is to be fitted in the new Claas Matador self-propelled combine. The other power units are the four cylinder direct injection Four 270 and the four cylinder 1.6 litre Four 99 diesels used in the S.F., Europa and Columbus combines.

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pumping light and heavy fuel oil — install

Fig. 197 High speed direct connected

HEAVY DUTY VIKING PUMPS

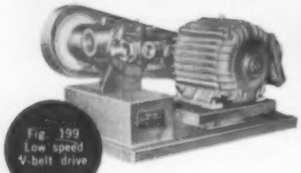
Fig. 199 Low speed V-belt drive

These two Viking Pumps combine all the qualities you want for smooth, positive delivery of light and heavy fuel oils, lube oils and other petroleum products. Figure 197 is a high-speed, direct connected pump and Figure 199 is a low-speed, heavy-duty unit.

Capacities range from 3 to 30 G.P.M. Speeds, 600 to 1800 R.P.M. Temperature range, —40 to 225 degrees F. Viscosity range, 30 to 10,000 S.S.U.

All are built for continuous or intermittent duty in such applications as filtration, circulation, transferring and booster service.

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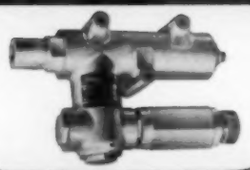
AMOT Model 4023 High Pressure Valve has balanced 3-way action. Suitable for pressures from 250 to 6000 psi.



AMOT Model 4021 Temperature Valve has a balanced 3-way action for pilot pressure control in any control system. Actuating temperature settings from 95 to 235° F. Available also with extensions.

AMOT Model B Thermostatic Valve has become Industry's STANDARD for Engine, Compressor, and Process temperature control. It is tamper proof. Available in 1½" to 6" in cast iron, ductile iron or bronze.

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THERMOSTATS CONTROLS SWITCHES VALVES SAFETY CONTROLS
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West Coast News

By James Joseph

TO Lake City Gravel & Materials Inc., Seattle, three Caterpillar D337 diesel-electric sets, to power a crushing plant. Sale by N. C. Machinery Co., Seattle.

SOLD to Don Taylor of Martin Van Lines, Seattle, two GM diesels (models 5062-3200 and 5062-7200) to replace engines in Chris Craft cruiser *Andonta*. Net rated hp: 181 @ 2800 rpm.

GRANITE Falls, Washington's W.R.W. Logging Co. has purchased a GM 5043-7101 (97 bhp at 2500 rpm) as replacement engine in a Washington Track Loader. Sale by Modern Motors, Inc., Seattle.

DELIVERED: to an oil company in the Los Angeles area, a Murphy MP-24, 207 hp at 1200 rpm dual fuel (natural gas and diesel) to drive gas compressor. Sale by Industrial Engine Service, Los Angeles.

TO replace a gas engine in a combination gilnetter-seiner operating Cordova, Alaska, waters and operated by Arne Johnson, a GM 5032-4100 (62 hp at 2200 rpm), 2-valve head GM marine engine. Sale to New England Fish Co.

FOR Bryants Boats, Inc., Seattle, six GM 4-valve head GM diesel marine engines (5042-4200s), rated 120 hp at 2800 rpm, for installation in new gilnetters being built for Columbia Ward's Fisheries, Queen Fisheries and Mr. Wilbur Peterson, all of Bristol Bay, Alaska.

AS standby power at Cabrini Hospital, Seattle, a Caterpillar D333 diesel electric set (rated 125 kw).

TO repower John F. Christal's *Traveler II*, a GM 5042-4100 (85 hp at 2200 rpm). Vessel operates from Renton, Wash.

SAN Diego's Acme Truck Co. has repowered three Mack dump trucks with 160 hp at 2500 rpm Cummins diesels. Three more gas-to-diesel conversions are upcoming.

DELIVERED: to west coast trucker Watson Brothers Transportation Co., home-based in Omaha, Neb. 75 new Mac B-67ST tractors powered with Mack Thermodyne diesels, replacing same number of gasoline units.

SOLD: to Gilbert Van Camp for three new 85 ft. sportsfishing boats, six Caterpillar D343s, rated 460 hp at 2000 rpm, two engines to power each boat thru 2:1 gearing. Sale by Shepherd Machinery Co., Los Angeles.

FOR underground missile silo power, the Air Force Ballistic Missile Division, Los Angeles, has purchased, over the last few months, some 200,000 hp of diesel engines, one of largest diesel orders on record.

TO Gordon Sand Co., El Segundo, Calif., a model C-160 Cummins diesel to replace a gasoline engine in an International Harvester dump truck.

THIRTEEN Peterbilt tractors (powered by model NH-220 Cummins diesels, 220 hp at 2100 rpm) have been delivered to Transportes Internationale, Calexico, Calif. Engine sale by Cummins Service & Sales, Los Angeles.

ENTERPRISE Motors, Los Angeles, has installed a C-160 Cummins diesel in an International truck, replacing a gasoline engine.

FOR refrigerated reefer car service, Pacific Fruit Express has purchased 25 air-cooled Deutz model F2L712 diesels driving brushless Delco generators (12.5 kw, 1200/1800 rpm).

IN pick-up/delivery service with Western-Gillette Trucking Co., Los Angeles, several of the new 354 cu. in. Perkins diesels.

MUTUAL Citrus Products, Anaheim, Calif. has repowered an International Harvester truck with a Cummins C-175, the turbocharged engine, replacing gas, rated 175 hp at 2500 rpm.

FOR the motor vessel *Coolidge*, an Allis-Chalmers 21000 marine engine. Sale by Pacific Marine Supply Co., Seattle.

TO Richland Tug & Barge Co., Washington, an Allis-Chalmers DAMR 1125.

Turbo Test Facility

A new test facility, designed to provide more efficient final production checkout of its turbochargers, has been put into operation by The Garrett Corporation's AiResearch Industrial Division. Compact and simplified, the new test unit basically consists of a combustor, operating on a mixture of natural gas and air, connected to a turbocharger by ducting. Pressurized air from plant supply is used to start the unit. As soon as proper operating pressure is reached, plant air is automatically cut off and the operation continues on a self-sustaining basis. Hot exhaust gas from the combustor propells the turbine wheel of the turbocharger, and a steady flow of air from the compressor is mixed with fuel in the combustor. On the compressor side, instrumented readings are taken of impeller speed, air flow, inlet and discharge temperatures. On the turbine side, inlet temperature and and pressures are recorded. These data, along with observation of lubricating oil flow and vibration amplitudes, provide the test operator with a complete final check on turbine and compressor performance, including vibration and mechanical functioning.

AVAILABLE MAY 15th! The completely new 1961 edition of the **DIESEL AND GAS ENGINE CATALOG,** Volume 26, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 608 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover and costs just $10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG,** 9110 Sunset Blvd., Los Angeles 46, Calif.

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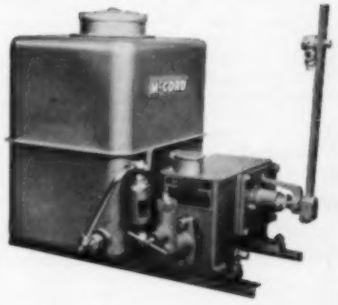

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Mid-West Diesel News

By L. H. Houck

EIGHT Macks, G-75LST's, COE, all aluminum forward tilt cab, 6-wheel tractors, Mack Thermodyne diesels to O. K. Motor Service, Chicago.

SIX Internationals, DCOF-405's, 140 in. highway tractors, 5 speed transmissions, 220 hp Cummins diesels, 72 in. sleeper cabs, to Daggett Truck Line, Frazee, Minn.

RUST Contracting & Supply Co., Belleville, Ill., has taken delivery on two International TD-9 tractors with Drott front end loaders from Mo.-Ill. Tractor Co., St. Louis.

NEW Trojan 404 front-end loader on rubber is attracting much attention in the Mid-West according to dealers E. W. Werner Equipment Co., Centralia, Ill.; O. B. Avery, St. Louis; Midland Truck & Equip. Co., Rock Island, Ill. Standard diesel is 336 hp GM. It has a 24,000 lb. lifting capacity.

HOUGH Payloader, H-120, to Peabody Coal Co., Coshocton, Ohio, from Mo.-Ill. Tractor Co., St. Louis.

ANDERSON-Gregory Const. Co., Nashville, has a new 17 yd. Euclid with GM 6-71 diesel in use on its Interstate 40 job, 90 miles east of Nashville. Euclid is from Euclid-Tennessee Corp., Nashville.

MAIN rock shovel on Anderson-Gregory's Interstate 40 job is a Koehring 1205 with a 375 hp Caterpillar V-8 diesel.

M&M Petroleum Co., Denver, has installed a P&H diesel, model 687H-18AT, 330 hp in a 1958 Peterbuilt truck and a P&H 280 hp diesel in a new 1961 Kenworth. Engines were purchased through the Diesel Division, Harnischfeger Corp., Denver.

SECOND P&H diesel to Stevenson Drilling Co., Denver, to power a G.E. Failing shot hole drilling rig. P&H model 487-HE-18, rated at 126 cont. hp at 1800 rpm, was purchased through Diesel Division of Harnischfeger Corp., Denver.

INTERNATIONAL TD-9 tractor to Wright Equipment Co., E. St. Louis, from Mo.-Ill. Tractor Co., St. Louis.

DROTT 4-in-1 front-end is a feature of a new International TD-15 delivered to A. H. Seebold Truck Service & Excavating Co., Granite City, Ill., by Mo.-Ill. Tractor Co. St. Louis.

THOMAS Quarry, Winchester, Ill., recently installed two Allis-Chalmers model 21000 diesels (power units) for crusher power. Installation and sale by Illinois Road Equipment Co., Springfield, Ill.

INTERNATIONAL TD-15 and hydraulic dozer delivered to Merle Wyatt, Kinderhook, Ill., by Mo.-Ill. Tractor Co., St. Louis.

TRI-STATE Mack Distributors, Memphis, has purchased a new site for its operations for $110,000 and will erect a 3,000 ft. distribution center for Mack trucks, announces F. A. Maddox, Sr., president.

FRED E. Cooper well servicing rig, recently purchased by Ralph Updike Well Servicing Co., New Castle, Wyo., is equipped with P&H diesel model 687-HE-18T, 6 cyl. turbo-charged, 265 hp rating at 1800 rpm. Cooper is made in Tulsa.

• DECATUR Sand & Gravel Co., Decatur, Ill., has installed an Allis-Chalmers 16000 diesel in a Bucyrus-Erie 48-B shovel. Installation and sale by Illinois Road Equipment Co., of Springfield.

LIVERPOOL Materials Co., Canton, Ill., recently purchased an Allis-Chalmers 21000 unit from Illinois Road Equipment Co., of Springfield, for crusher.

OBSERVED: 9-W Monighan walker, 11 yd. capacity, repowered with GM quad (four 6-71's) with electric swing from GM 6-71 generator set, digging 800 tons an hour in 100 feet of Colorado river water, for Texas Construction Materials Co., at Columbus plant.

SMITH Ford, Jefferson City, Mo., reports several Ford diesel truck sales and its appointment as a Cummins service shop—parts and diesel service for over-the-road trucks.

O. B. Avery Co., St. Louis, is a newly appointed dealer for Clark Equipment Co., construction products—Michigan tractor shovels, scrapers and other heavy duty earth moving equipment.

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From starting to operating clutches and controls, Quincy Compressors ride the waves with the ships that carry the world's freight. Quincy air power is dependable and low in cost.

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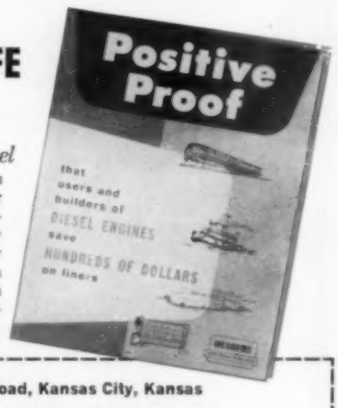

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MECROME
FIGHTS FRICTION TO THE FINISH

Florida Diesel News

By **Ed Dennis**

DIESEL Engine Sales Inc. of St. Augustine will launch its 900th trawler on May 20th. The 68 ft. shrimp trawler will be powered by a D342C Caterpillar marine diesel engine and will go to a Texas fishing company.

COASTAL Barge & Towing Co., Miami, operates a 60x20 ft. sand dredge barge. The eight in. Georgia sand pump is powered by a General Motors 6-71 diesel engine with 3.5:1 Twin Disc r&r gears. This firm also operates the 56 foot tug *Marion Adele* powered with two GM 6-71's with 5:1 Snow-Nabstedt r&r gears.

THE 152 ft. yacht *Norango* of Panama stopped at Dade Drydock for a few weeks. It is powered by a Swedish-designed, British-built five cylinder Polar diesel engine rated 800 hp at 250 rpm.

MODEL HD-260 Continental diesel engines power the two model 125 Yaeger air compressors that the Miami Sewers & Water Dep. bought from Florida Georgia Tractor Co. The four cylinder diesels are rated 72 hp at 2200 rpm.

TWO DW-21 Caterpillar tractors with No. 470 scrapers and powered by six cylinder turbocharged Caterpillar 300 hp diesel engines were barged to Hog Island, near Nassau, by the 76 ft. Atlas-powered tug, *Jay-Gee* of Miami, for construction of a new golf course.

BELCHER Towing Company's pusher type, 65 ft. tug, the *Virginia B*, is powered by a pair of Caterpillar model D342 diesel engines each rated 210 hp at 1225 rpm with Cat r&r gears. For electrical power it depends on two GM dieselized Electric Machinery 25 kw, 120/208 volt, 60 cycle generators.

UP near Brooksville in a lime rock operation, D. M. Pappy & Sons are using two TS-260 Allis-Chalmers motor scrapers (17 cu. yd. heaped). These are powered by Allis-Chalmers 16000 diesel engines rated 230 hp at 2000 rpm and Fuller six speed RoadRanger transmissions.

SHIPPED on the *M. V. Boge*, two Caterpillar D6 tractors for Aduana Pureto Malias De Galvez Guden C. A. of Guatemala and a Caterpillar Traxcavator (2 cu. yd.) powered by a 105 turbocharged Cat diesel for Cencol of Tegucigalpa, Honduras.

THE *State Star* a 90 ft. oceanographic research vessel powered with a pair of GM 6-110 diesel engines and 2.5:1 hydraulic r&r gears, stopped at Miami bound for Puerto Rican waters. Two GM dieselized 20 kw Delco generating sets supply the necessary power for the vessel.

MARINE Engine Equipment Co. of West Palm Beach, supplied the model OM-636 Mercedes Benz dieselized Onan UF3N generator set on the newly launched *Bound in Blue*. The diesel is rated 13 hp at 1200 rpm.

EDWARD Parkinson Co. delivered to A. K. Hockaday of Fort Pierce, two Diamond T, 931 hiway trailers powered by Cummins NH-250 diesel engines, Fuller R96 ten-speed transmissions and Spicer 14 in. two plate clutches.

DOWN at the Key West Municipal Light Plant they are using one 16-567B Cleveland Diesel 1100 kw generating set and two 16 cylinder 278-A, 1000 kw generating units along with the plant's other kilowatt producing diesels.

THE Miami Br. of Detroit Diesel Engine Div. supplied a model 3-53 diesel rated 70 hp at 2200 rpm and Borg clutch for a Bucyrus Erie excavator owned by Robert Edens of Lake Placid and two model 3-71's for Unit draglines (90 hp at 2100) for the Lee County Mosquito Control Division.

ROLLS Royce turbocharged, type C8TFLM, 8 cylinder marine diesel engines, each rated 350 bhp and two Lister 110 volt dc 30 kw diesel generating sets, are in the twin screw *M/V Suvretta* currently cruising in the West Indies. The Edward Parkinson Co. are the Florida distributors for these diesel engines.

A model 45C3⅛ Fairbanks Morse one cylinder diesel having a bore and stroke of 3⅛ x 4 in. and radiator cooled was installed at the Kissimmee Light Plant to supply power for the main engine air compressor.

THE Miami Water Dept. will install, at their Gallaway Rd. Plant, an eight cylinder model DGSQ38 Enterprise diesel engine rated 2120 hp at 360 rpm with a Lufkin gear increaser and an Allis-Chalmers pump. The unit is rated 38 million gpd.

CATS and Cows near Lake Wales; Rozier Machinery of Tampa supplied a 40 kw Caterpillar diesel generating set powered with a D320 turbocharged Cat diesel to replace a gasoline powered unit at the Rucks Dairy Farm.

OVER at Bradenton, Capt. Wilbur Lewis repowered his 35 ft. *Cathy-Ann*, with a six cylinder V-53 General Motors marine diesel engine and 2:1 Borg Warner r&r gears. The diesel, rated 195 max bhp at 2800 rpm, was supplied by the Jacksonville Br. of Detroit Diesel Div.

FOR the Caribe Haiti Hotel, Port au Prince, Haiti, a D318 Caterpillar dieselized 100 kw 120/208 volt emergency generating set; engineered by John Colburn of Shelley Tractor & Equipment Co. of Miami.

A total of ten Johnston 48 in. model 42 P.O. propeller pumps, each rated 56000 gpm will be installed in pump stations 127, 129, and 131 of the Central & Southern Florida Flood Control Project. Each pump will be powered by a D342 C-T Caterpillar diesel engine rated 225 hp at 1200 rpm through Philadelphia transmissions and gear reducers.

WILLIAM Poddick of the Miami Br. Detroit Diesel Engine has been named one of the six top G.M. diesel servicemen in the country. He received the "Service Craftsman Guild," highest award for diesel know-how, for 1960 in Zone 2 which is composed of seven southeastern states.

Heads Plant Sales

John D. Mitcham has been appointed plant sales engineer at the Gainesville, Texas, plant of The National Supply Company. He will be responsible for sales and service of the firm's torque converters hydraulic couplings, and other industrial products.

AVAILABLE MAY 15th! The completely new 1961 edition of the **DIESEL AND GAS ENGINE CATALOG,** Volume 26, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 608 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover and costs just $10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG,** 9110 Sunset Blvd., Los Angeles 46, Calif.

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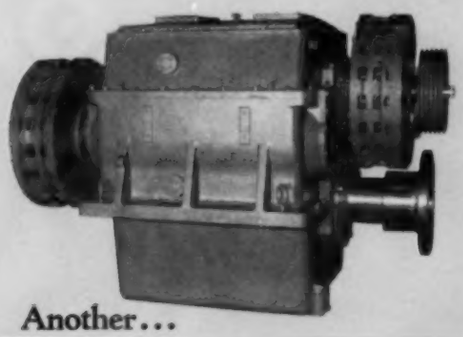

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Don Bramley, *left, Sales Engineer, The Cooper-Bessemer Corporation, and*
James Rawlings, *Superintendent of generating plant, Augusta, Kansas report...*

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